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Minnesota Division, Northwest Petroleum Association, Radisson Hotel, Minneapolis, Jan. 14, 15.

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Ohio Petroleum Marketers Association, Neil House, Columbus, O., Feb. 24, 25, 26.

NATIONAL PETROLEUM NEWS

Vol. 22 No. 46

Published by

The National Petroleum Publishing Co.
1213 W. Third St., Cleveland, O.

Tel. CHerry 7672

Branch Offices:

Tulsa, 904 World Bldg., Tel. 3-7132.

New York, 342 Madison Ave., Tel. Vanderbilt 3951.

Houston, 2420 Gulf Bldg., Tel. Fairfax 6286.

Chicago, 35 E. Wacker Drive, Tel. State 4141.

Subscription rate $3.50 per year, U. S., Mexico and Canada; $5 Foreign countries. Current copies 10 cents; for back issues more than two months old 25 cents per copy.

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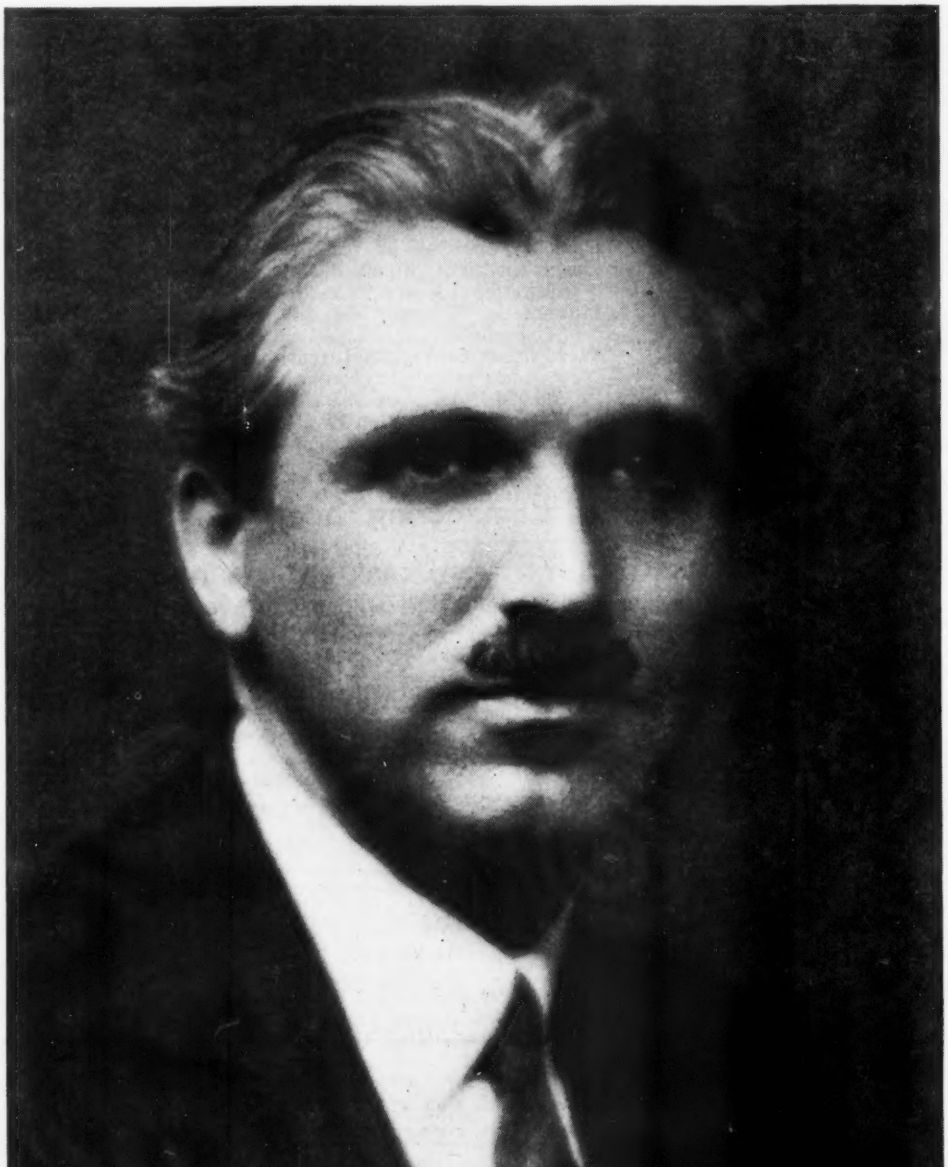


CHARLES E. ARNOTT, president of Vacuum Oil Co., has rounded out 34 years in our industry, 27 of which have been with the company he now heads. It was in 1903 that Mr. Arnott joined the marketing organization of the Vacuum. In promoting sales of Gargoyle brands he has traveled over most of the world. He has also helped to shape much of Vacuum's sales policies.

Mr. Arnott's elevation to the official family of Vacuum came in 1912 when he was elected a director when Vacuum was reorganizing after the dissolution of Standard Oil Co. of New Jersey. In 1924 he was elected a vice-president and last Feb. 10 he was elected president. Recently Mr. Arnott was elected vice-chairman of the board of directors.

NATIONAL PETROLEUM NEWS

Published at
1213 W. Third St.
Cleveland

Branch Offices
Tulsa, New York, Houston, Chicago

Vol. 22 **CLEVELAND, November 12** **No. 46**

Refiners Warned of Gasoline Stock Growth Danger in Lower Demand

By V. B. Guthrie
N. P. N. MANAGING EDITOR

By Telegraph
CHICAGO, Nov. 11

FACING an emergency situation with regard to gasoline supply and the stability of gasoline markets in the coming months, executives of the oil industry broke precedent at a meeting here last night under the auspices of the American Petroleum Institute.

Nearly 250 men, representing about 95 per cent of the refining industry, it was estimated, met to hear two reports which concurred in the main in presenting the extent to which refineries in this country must curtail their production of gasoline if stocks are not to be increased to an unduly burdensome level by April 1, next.

Heads and representatives of the principal oil companies of the country discussed the reports in the light of the responsibilities thrown on the individual companies and operators to remedy the present unstable condition.

This was the first time such a meeting has been held in the oil industry, a meeting open to all oil men and the public alike. In the seriousness with which the present situation was discussed, it was somewhat reminiscent of emergency measures which were taken during the war.

Preliminary to the presentation of the two reports on rate of gasoline manufacture to prevent increases in stocks, the oil men were told that, for the period covered by the reports, Oct. 1, 1930, to April 1, 1931, but little impetus from the general business situation will make itself felt in any increase in gasoline demand.

A "break-even" demand is the most that the industry can count upon and the oil men present were told by Joseph E. Pogue, petroleum economist, and acting chairman of the committee on petroleum economics of the Federal Oil Conservation Board, not to be surprised if there was some slight decrease in demand as compared with the corresponding period of 1929-1930. One of the reports was the board's.

Little if any improvement in general business will make itself felt the rest of this year, said Dr. Pogue, basing his opinion, he said, on advices from several sources his committee had received. There may be some improvement in the first quarter of next year, possibly not until the second quarter.

The industry must keep in mind, he warned, that just as gasoline consumption had held up after the present general business conditions had started to make themselves felt, so the pickup in consumption would lag after general business had started to improve.

In addition to the report of the economics committee of the federal board, the oil industry was presented through this meeting with a report of a special committee on the economic situation of the institute, of which J. Edgar Pew, Sun Oil Co., was chairman. Both committees were asked about a month ago to figure out the rate at which refineries in this country must produce gasoline if stocks are not to be held in check by April 1, next.

Both reports concurred in estimating no increase of any great amount in gasoline consumption for the six months and both reports also concurred in placing the maximum desirable figure for gasoline stocks as of April 1 at 40,000,000 barrels. Stocks on Oct. 1 were better than 38,000,000 barrels.

Both reports brought out that

curtailment of manufacture of gasoline to the extent of 7 to 8 per cent must be carried on by refineries in this country if stocks were not to be increased above 40,000,000 barrels. They brought out that manufacture of gasoline carried on at the present rate will bring stocks up to around 60,000,000 barrels by April 1. The report of the oil board's committee on economics, commented on at the meeting by Dr. Pogue, is received on the following pages in this issue.

That 218,000,000 barrels of gasoline will be produced in the six months at the current rate of manufacture, was brought out by John D. Gill, Atlantic Refining Co., chairman of a statistical sub-committee of the institute committee, who presented the report of his committee. Last year, in the corresponding period, 221,000,000 barrels were produced. Imports for the six months this year will be 10,000,000 barrels, the report estimated, as against 6,000,000 barrels last year.

This would give a total gasoline supply of 228,000,000 barrels, about the same as for the corresponding period last year, he reported, but last year 22,000,000 barrels of gasoline output went into storage to help build the situation for which the industry now seeks a remedy.

If domestic and foreign demand for the six months this year is 208,000,000 barrels, as estimated, about 20,000,000 barrels would go into storage, it was brought out. On top of the present 38,000,000 barrels or better, this would bring total stocks on April 1 to 58,000,000 barrels.

If stocks on April 1 were held to 40,000,000 barrels, which had been estimated through questionnaires sent individual oil companies as the maximum necessary amount, manufacture of gasoline would have to be scaled down by about 18,000,000 barrels to 209,800,000 barrels, the report brought out, a decrease of 8.2 per cent.

To produce this much gasoline, the institute committee estimated, 413,000,000 barrels of domestic and foreign crude would be necessary. With 12,000,000 barrels for export purposes and about 10,000,000 barrels for use without processing, a total of 435,000,000 barrels of crude would be needed in this country, of which volume 29,000,000 barrels would be imported, it was brought out. Domestic production would be 406,000,000 barrels, at the daily rate of 2,235,000 barrels.

While refinery production at this rate would necessitate a reduction in fuel and gas oil stocks during the period of more than 18,000,000 barrels in the territory east of California to meet demand, this would leave in storage as of April 1, 1931, nearly 18,000,000 barrels, a sufficient margin for all purposes, the committee estimated.

E. G. Seubert, president, Standard Oil Co. of Indiana, said his company was importing gasoline to its controlled outlets and to cover contracts, and that, if any refiner wanted to take over any part of those contracts, the Indiana Standard's imports of gasoline would be decreased to just that extent.

Walter Miller, Continental Oil Co., Ponca City, said the refining industry could very easily maintain stocks at their present levels if executives of all refining companies would pass the word down that their plants are to be run to meet demand only and that no additional gasoline is to go into storage.

A startling rate of operation of refineries during the six months to April 1 was shown to be in the industry's mind through a compilation by the committee of reports from individual plants in answer to its questionnaire. For example, the compilation showed that all refineries, based on their own reports, would likely run 490,000,000 barrels of crude in the six months. At current yields this would make 238,000,000 barrels of gasoline, with 10,000,000 barrels to be imported, a total supply of 248,000,000 barrels.

With demand estimated at 208,000,000 barrels, this would mean that 40,000,000 barrels would go into stocks, bringing the total on April 7 to 78,000,000 barrels. The same compilation of returns from individual refiners showed their own estimate of stocks April 1 to be 52,000,000 barrels.

Chairman Gill said this figure for stocks must have been based on a pre-supposition of an increase in demand for gasoline, in refiners' minds, of about 14 per cent, as compared with last year; or a reduction in yield of gasoline from crude of about 5 per cent, which in turn would mean an undesirable accumulation of gas and fuel oil stocks.

In the discussion following the presentation of the reports, Robert Penn, Penn Oil Co., a producer in Texas, suggested that the amount of domestic crude deemed necessary by the institute committee to produce gasoline under a curtailment program be allocated among the various producing districts. Chairman Gill presented the following figures based on holding gasoline stocks on April 1 to 40,000,000 barrels:

Field	Total Demand Barrels	Daily Average Barrels
Pennsylvania	10,561,000	58,000
Kentucky	4,447,000	24,440
Lima and Indiana	1,809,000	9,900
Illinois and Indiana	3,325,000	18,200
N. La. and Ark.	15,716,000	86,400
W. Tex. and N. M.	57,562,000	316,300
Okla., Kans., N. Tex.	173,574,000	953,700
Gulf Coast	32,365,000	177,800
Rocky Mountain	10,663,000	58,600
California	96,476,000	530,000
Foreign	28,875,000	158,700

Proration Again Attacked At Darst Creek

HOUSTON, Nov. 8.—Louisiana Oil Refining Corp., now stock-controlled by the Cities Service Co. through the Arkansas Natural Gas Co., has obtained temporary injunction against the Railroad Commission of Texas enforcing proration at 30,000 barrels daily in the Darst Creek field of the Luling fault zone.

Loreco's share of prorated production under a new schedule is approximately 2270 barrels daily as compared with 4500 barrels called for in its recent purchase contract of Darst Creek properties from the United North & South Developing Co.

Decision on the Darst Creek injunction will hinge on court action in the Danciger Oil & Refining Co. case, affecting Panhandle properties, which is called for hearing on permanent injunction at Austin this week.

The Editors' Viewpoint

Oil Industry Can Help In Employment Problem

AT THE time President Hoover has appointed a commission to consider the unemployment problem, it is interesting to note that some consideration is being given in the oil industry to the five-day week.

One Mid-Continent refiner has made a preliminary study of the possibilities of the plan as applied to his plant. He finds that, without disturbing the shift men who are classed as skilled workmen, about 40 additional men would be given work if the rest of the normal force were placed on the five-day basis. This would mean, of course, a reduction in the total weekly pay of the men who would be reclassified. No cut in the rate of pay is contemplated.

Such a departure from the existing custom would be taken solely to provide jobs for men now unable to find work.

The investigation made by this refiner was for the purpose of being informed in the event that concerted effort is taken by employers the country over to relieve unemployment distress. To inaugurate the plan single-handed, this refiner believes, would accomplish nothing except to make his costs higher than those of competitors, as the plan obviously would call for an increase in payroll.

Edwin B. Reeser, president of the American Petroleum Institute, has on several occasions publicly urged the adoption of the five-day week throughout industry. It is Mr. Reeser's opinion that this age of machine production can be fitted to humanity's needs only by reducing the working time per man. He says that he has had a number of letters from labor leaders approving his stand. It is to be expected that Mr. Reeser will have more to say on this subject when he makes the president's annual address before the Institute in Chicago this year.

There are difficulties in the way of this plan's adoption, of course. But it is timely that the oil industry should consider that it must take its share of national responsibility for the solution that must be found by business and industry for this very real problem.

An instance came to our attention this week that points to the condition that exists. An oil company, operating leases whose production is small, told its field force it would be necessary to get along with fewer men. The employes held a meeting and countered with the proposal that the company keep everybody at work, paying half their salaries and deferring the rest until conditions improved. They said they all had homes on the properties and the half pay would enable them to buy the bare necessities of life. If some were discharged there would be no place for them to go. The company met the request and that particular addition to unemployment was averted.

President Hoover has done a constructive thing in centering attention on the unemployment problem and refusing to pretend that everything is serene. But the government cannot carry the full load. Only the sum of the employers' best effort will give the needed result.—L. E. S.

Antidote for Credit Abuse

THE efforts of the Standard Oil Co. of Louisiana to give the cash customer a break over the credit customer through a 1-cent discount for cash deliveries, is a praiseworthy step toward eliminating the abuses of credit on service station deliveries.

It has been the custom in most businesses that operate with a range of prices for the same goods to give the cash buyer a shade the better in prices. Our industry has been operating on a reverse basis; the credit customer in general has been paying only the same price as the cash customer and often has been paying 2 cents a gallon less through the abuse of the commercial discount.

The cost of carrying credit is high. It may not be worth the full 1 cent a gallon given the cash customer by the Louisiana customer, but it may amount to that figure if all the items that enter into credit are included, such as bad account losses, extra bookkeeping, interest on the money tied up for 30 days or longer, and the cost of the mechanical set-up necessary to record the credit business.

A southern marketer recently told us that, when service station credits were introduced in his territory, he had to buy another bookkeeping machine, hire two more clerks and set aside $30,000 to $40,000 of his operating capital to meet this form of competition. This was the expense of carrying approximately 1200 retail customer accounts.

If the cost of distribution is to be reduced, elimination of needless credits is a step of primary importance. It seems unfortunate that the competitors of the Standard Oil Co. of Louisiana did not join in this experiment of trying to minimize retail credits.—R. B. S.

U. S. Committee Asserts Drilling Restriction Is Only Cure

CLEVELAND, Nov. 11

RESTRICTION of drilling, abridgement of plant expansion, and a modernization of the prevailing method of crude oil production to place the producing division of our industry in low-cost brackets and on a competitive basis with the rest of the world, are remedies for the over supply of petroleum suggested in the report of the Federal Oil Conservation Board's voluntary committee on petroleum economics to Secretary of the Interior Wilbur Nov. 8.

The committee which drafted the report consisted of Dr. Joseph E. Pogue, acting chairman and secretary; Ray M. Collins, H. W. Lowrie Jr., and H. P. Grimm. J. Elmer Thomas, chairman, was absent in Europe when the call was issued early last month for a survey of potential petroleum requirements for the six-month period from Oct. 1, 1930, to March 31, 1931, and how the requirements might be met without materially increasing oil inventories.

The committee predicted that demand for gasoline will not likely exceed the demand for gasoline in the six-month period between Oct. 1, 1929, and March 31, 1930, and may even fall below it.

If the industry is not to overproduce the supply of gasoline in the present six-month period it will be necessary to adjust its output of gasoline to a basis predicated on the assumption that no increase in gasoline demand may be expected this six months over demand in the six-month period a year ago.

"The industry is now operating on a basis geared to a 7 per cent increase in gasoline consumption," the committee said in its summary. "It is obvious, therefore, that a substantial reduction in operating rates is called for. A curtailment to balance a break-even demand for gasoline will require a reduction of 7 per cent from the estimated October rate of gasoline supply, if gasoline inventories next spring are not to exceed 45,000,000 barrels.

"If a reduction of 7 per cent in the supply of gasoline is spread on an even percentage basis over the various sources of gasoline, then a crude-run-to-stills of 2,310,000 barrels per day and a domestic crude oil production of 2,270,000 barrels per day are indicated. Should gasoline demand prove more adverse or refiners confine their gasoline curtailment to straight-run operations, additional restriction of refinery runs and crude oil production would be called for and tables are presented to cover these contingencies. If, on the other hand, demand should turn out to be more favorable, then the inventory situation may be permitted the benefit.

"A domestic crude oil production of 2,270,000 barrels per day, corrected for estimated overage to date, becomes 2,240,000 barrels per day and the latter figure may be allocated as follows (or other quotas in proportion): California, 535,000; Oklahoma, 535,000; Texas, 719,000; and all other states, 451,000.

"A method of inventory control of gasoline is presented which may be used as an operating guide without predetermination of the demand for gasoline. The import situation is analyzed and it is shown that while imports of crude petroleum have decreased, receipts of gasoline and fuel oil from abroad have increased; and that while 10 per cent of our total supply of oil is imported, 15 per cent is exported."

Cure of the present depressed conditions in the industry can not come from present relief measures such as proration of crude oil production, the committee indicates. Cure can come only from the elimination of competitive off-set drilling, it indicated, saying that the fundamental economic maladjustments arise from facts that the producing division is overdeveloped, overcapitalized, and drilling is competitive.

Unit operation of producing pools is the remedy for relief from the fundamental maladjustment, the committee indicates. It makes a specific recommendation for unit operation of the Kettleman Hills and Belridge areas in California which have enormous potentialities for the manufacture of low-cost gasoline.

Unless there is unit operation, the committee warned, more drastic restriction of refinery operations and crude production in other districts will be mandatory if any relief from the present situation is to be attained. Kettleman Hills and Belridge have the capacity for extending overproduction over

Table 1

Refinery Curtailment Necessary to Meet Varying Demands for Gasoline During the Six Months Ending March 31, 1931

Gasoline demand 6 months ending Mar. 31, 1930	Assumed change in demand	Indicated demand 6 months ending Mar. 31, 1931	Supply at estimated October rate	Change in stocks *a*	Curtailment of gasoline supply from estimated October rate to result in stocks on March 31, 1931 of		
					40	45	50
Mill. Bbls.	Per Cent	Mill. Bbls.	Mill. Bbls.	Mill. Bbls.	Mill. Bbls.	Mill. Bbls.	Mill. Bbls.
208	—4%	200	230	+30	—12%	—10%	—8%
208	—2%	204	230	+26	—10%	— 8%	—6%
208	0	208	230	+22	— 9%	— 7%	—5%
208	+2%	212	230	+18	— 7%	— 5%	—3%
208	+4%	216	230	+14	— 5%	— 3%	—1%

a Stocks Sept. 30 were 38.3 million barrels.

a considerable period, the committee stated.

The committee's report consists of a series of tables with expository notes which follow:

"The problem of estimating the crude oil requirements of the country must be approached through an analysis of the prospective consumption of gasoline, the principal product of crude petroleum, and a translation of the gasoline demand into the domestic crude oil needed to provide the necessary gasoline.

"The problem is complicated by the impossibility of accurately gauging future demand at a time of acute economic unsettlement, as well as by the variations possible in the volume of components that go to make up the gasoline supply. To meet these difficulties a range of estimates is presented which will serve to show the great significance of relatively small differences in demand and the leverage effect of changes in the supply of cracked and imported gasoline; and from this range the most probable figures may be selected.

"The past statistics used in this report and employed as a basis for the calculations are taken from the published reports of the U. S. Bureau of Mines.

Demand for Gasoline

"The consumption of gasoline in recent months has been sharply diverted downward from its normal course by the business depression. To forecast the demand for gasoline over the next six months in consequence requires a specific knowledge of the trend of business activity during that period. The basis for an accurate forecast of business over the near-term future is not available and therefore a dependable prediction of gasoline consumption cannot be given.

"In major depressions, however, so far as evidence is available, gasoline consumption is drastically affected and shows a lag of several months in following business activity, both on the downturn and on the upturn. During the third quarter of the year, gasoline consumption was running about 7 per cent below a level calculated as normal, and with the business outlook still obscure the prospects for a favorable gasoline demand during the period under consideration are not promising.

"In the absence of a basis for precision, a range of demands from a decrease of 4 per cent to an increase of 4 per cent has been forecasted and this spread seems likely to include the actual developments. See Table 1. Present evidence is suggestive that demand is apt to run toward the central or lower measures of this range.

"To translate this demand range into supply quotas requires the selection of a gasoline inventory objective for the end of the period, March 31, 1931. The American Petroleum Institute has recently ascertained through questionnaires that an adequate gasoline working stock for Sept. 30 is 29,000,000 barrels, which when adjusted for natural gasoline is reduced to 27,200,000 barrels. Seasonally corrected, the latter figure becomes 38,800,000 barrels on March 31. While around 40,000,000 barrels therefore appears a desirable inventory for next spring, the committee has used 45,000,000 barrels, because of the shortness of the intervening liquidation period and the difficulty of attaining the lower figure. In Table 1, however, the calculations have been made on the basis in turn of 40,000,000, 45,000,000 and 50,000,000 barrels so that the effect of varying inventory assumptions may be observed.

"It may be read from Table 1 that a break-even demand, with an inventory objective of 45,000,000 barrels for next spring, will require curtailment of 7 per cent in the gasoline supply from the estimated October rate. Should demand show a decline of 4 per cent, a curtailment of 10 per cent would be required. It is seen further that to gain an inventory position of 40,000,000 barrels, instead of 45,000,000 barrels, an additional curtailment of 2 per cent would be necessary.

Relation of Gasoline Demand to Domestic Crude Oil Requirement

"To convert gasoline demand into a domestic crude oil requirement necessitates a consideration of the alternate

Table 2

Effect Upon Domestic Crude Oil Consumption of Varying Rates of Gasoline Demand, Assuming Gasoline Stocks of 45 Million Barrels on March 31, 1931, and All Curtailment of Gasoline Supply (from the Estimated October Rate) Confined to Straight-Run Refining

Period covered: 6 months ending March 31, 1931

Per cent change in gasoline demand from previous year	Required runs of crude oil to stills Thous. Bbls. Daily	Indicated curtailment from estimated October rate	Domestic crude oil required Thous. Bbls. Daily	Indicated curtailment from October 18th rate
—4%	1950	—20%	1910	—20%
—2%	2040	—16%	2000	—16%
0	2130	—12%	2090	—12%
+2%	2220	— 8%	2180	— 8%
+4%	2310	— 4%	2270	— 4%

Table 3

Effect Upon Domestic Crude Oil Consumption of Varying Rates of Gasoline Demand, Assuming Gasoline Stocks of 45 Million Barrels on March 31, 1931, and Curtailment of Gasoline Supply (from the Estimated October Rate) Applied on the Same Percentage Basis to All Sources of Gasoline

Period covered: 6 months ending March 31, 1931

Per cent change in gasoline demand from previous year	Required runs of crude oil to stills Thous. Bbls. Daily	Indicated curtailment from estimated October rate	Domestic crude oil required Thous. Bbls. Daily	Indicated curtailment from October 18th rate
—4%	2220	—8.5%	2180	—8.5%
—2%	2270	—6.5%	2230	—6.5%
0	2310	—4.5%	2270	—4.5%
+2%	2360	—2.5%	2320	—2.5%
+4%	2410	—0.5%	2370	—0.5%

Table 4

Effect Upon Allocation of Crude Oil Consumption of Varying Rates of Gasoline Demand, Assuming Gasoline Stocks of 45 Million Barrels on March 31, 1931, and Curtailment of Gasoline Supply (from the Estimated October Rate) Applied on the Same Percentage Basis to All Sources of Gasoline

Period covered: 6 months ending March 31, 1931

(In thousands of barrels per day)

Areas	Suggested percentage allocation	Suggested allocation basis following changes in gasoline demand				
		—4%	—2%	0	+2%	+4%
California	23.9%	521	533	542	555	567
Oklahoma	23.9%	521	533	542	555	567
Texas	32.1%	700	716	730	745	761
Others	20.1%	438	448	456	465	475
Total, U. S.	100.2%	2180	2230	2270	2320	2370

sources from which gasoline is derived. The gasoline, or motor-fuel supply, is made up of five components: straight-run gasoline, obtained from crude oil by distillation; cracked gasoline manufactured from gas and fuel oil; natural gasoline extracted from natural gas; imported gasoline; and benzol. The composition of the gasoline supply in September, 1930, was as follows:

Components	Thous. Bbls. Daily	Per Cent
Straight-run	607	47.3
Cracked	476	37.1
Natural	142	11.1
Imports	51*	4.0
Benzol	7	0.5
Total	1283	100.0

*Largely cracked gasoline.

"It is seen that less than half the supply of gasoline is derived *primarily* from crude oil; hence the variations in the other components of gasoline have a profound influence upon the demand for crude oil. Each barrel of gasoline from the other sources replaces *four* barrels of crude oil. This relationship is of far-reaching importance in the economics of petroleum.

"In Table 2 is presented a series of gasoline demands translated into domestic crude oil requirements on the assumption that the other components of the gasoline supply are maintained at the estimated October rate with the entire required adjustment made in straight-run refining. A glance at this table reveals, on the basis shown, that the domestic crude oil requirement will range from 1,910,000 barrels per day to 2,270,000 barrels per day, according to the rate of change in gasoline demand.

"A break-even demand calls for 2,090,000 barrels daily of domestic crude oil. These figures suggest such a drastic curtailment in crude oil production that it seems desirable to consider whether the other components of gasoline cannot be adjusted so that the burden of curtailment would fall less heavily upon the crude oil producer.

"Cracked gasoline is subject to restriction by the shut-down of cracking stills; this adjustment can be made with minimum dislocation to the crude oil situation, but such action is hindered by the competitive sale of anti-knock gasoline, whose quality would suffer if the supply of cracked gasoline were not curtailed.

"Natural gasoline is a by-product and its supply is not readily subject to control. Imports of gasoline could be cut down by manufacturing less at the source. Benzol is negligible in volume and may be disregarded. Despite difficulties, all sources of gasoline supply can be reduced, if necessary.

"Table 3 shows the effect of varying gasoline demands upon runs to stills and domestic crude oil required, under the assumption that the necessary curtailment of the gasoline supply is applied on the same percentage basis to all sources of gasoline. It may be observed, on this basis, that a break-even demand will exact a reduction (from the estimated October rate) of 4.5 per cent in refinery runs, and a like cutting down (from the Oct. 18 rate) in the domestic output of crude oil.

"Further, each variation of 1 per cent in the demand factor requires a corresponding adjustment of 1 per cent in the degree of curtailment; that is, if gasoline demand drops an additional 1 per cent, an extra 1 per cent of curtailment will be required: and *vice versa*. In view of the relationships brought out in Tables 2 and 3, the committee feels that the present emergency calls for a reduction in all sources of gasoline supply, despite the inefficiency of maintaining idle crackers, although a restriction of cracking can be justified only on the basis of expediency.

Table 5

Suggested Course of Gasoline and Crude Oil Stocks From August 1930 to March 1931 to Insure Gasoline Inventories of 45 Million Barrels on March 31, 1931, and No Increase in Crude Oil Stocks

(In millions of barrels)

		Gasoline	Crude Oil
1930	Sept.	38.3*a*	521*a*
	Oct.	37.0	521
	Nov.	38.2	521
	Dec.	40.3	521
1931—	Jan.	43.5	521
	Feb.	44.6	521
	Mar.	45.0	521

a Actual.

Allocation of Domestic Crude Oil Requirements

"Having calculated a range of domestic crude oil requirements, depending upon the demand for gasoline, the inventory objective for next spring, and the type of curtailment adopted by refiners, we now approach the problem of allocating the requirements to the principal oil production areas. After consideration of the various aspects of this matter, the committee suggests an allocation based with slight modification upon recent proration schedules in the principal producing areas, on the assumption that such programs represent practical adjustment in the direction of developing tendencies. This allocation, under varying gasoline demands, is presented in Table 4.

The foregoing analysis indicates that no increase in gasoline demand, under the assumptions previously outlined, calls for domestic runs to stills of 2,

310,000 barrels per day and domestic crude oil production of 2,270,000 barrels per day. The question arises whether such a schedule will provide sufficient other products. Upon analysis, no deficiencies arise except possibly in the case of fuel oil east of California, and this contingency depends in part upon the extent to which fuel oil demand is adversely affected.

"Present evidence suggests that refinery runs of 2,310,000 barrels per day, or less, will lead to heavy drafts on fuel oil stocks east of California, but a deficiency, if it arises, can be made up in several or all of the following ways: By increasing the canal movement from California where stocks are excessive; by reducing cracking further; by running a larger proportion of heavy crudes; by increasing the imports of Venezuelan and Mexican crude and fuel oil; and by decreasing the imports of foreign gasoline.

"The committee feels that a sound gasoline schedule should not be permitted to be upset by fuel oil commitments.

Check on Supply Through Inventory Control

"It is possible to set up a control of supply without estimating in advance the demand for gasoline. This may be done through predetermining monthly inventories that would conform to desired operating schedules and then adjusting supply from time to time in order to hold inventories to the prescribed levels.

"Table 5 is presented as a suggested course of gasoline and crude oil inventories which would lead to gasoline stocks of 45,000,000 barrels on March 31, 1931, and no change in crude oil stocks.

"While the committee favors liquidation of crude oil inventories, which are regarded as far too large, it seems doubtful if liquidation can be accomplished this winter at a time when the seasonal and cyclical factors are both adverse. For the future, however, the committee favors a reduction of crude oil stocks at the rate of 100,000 barrels daily for an indefinite period; at this rate seven years would be required to cut domestic crude oil stocks in half."

Industry Must Adapt Its Policies To Changed Conditions--Reeser

By Telegraph

CHICAGO, Nov. 11

THE fact that the oil industry, during the next six months at least, faces a decline in rate of increase in demand for its principal product, gasoline, makes necessary quickened effort to solve its overproduction problems, four speakers brought out in their reports and addresses before the American Petroleum Institute meeting at Chicago.

The immediate outlook depends upon two things, E. B. Reeser, president of the institute, said in his address at the general session Nov. 11.

"First, the rapidity with which general business conditions improve and, second, the ability of producers, refiners and marketers to adapt their mental operations and company policies to the changed conditions under which we must operate," Mr. Reeser said.

"In my judgment, the latter is more important. I believe the common sense of the men engaged in the petroleum industry is equal to the test."

Stock of crude and refined products above ground constitute an available supply ready for the market at some price, Mr. Reeser continued, stating that every barrel in excess of actual working stocks required as a reserve margin of safety in operation is actual excess supply. This should be reduced in an orderly fashion at the earliest expedient opportunity, he said.

"With knowledge of the existing condition of supply and demand, no economic reason can be found, no plausible excuse manufactured, to justify continuous additions to petroleum stocks," he asserted.

The answer to the problem, Mr. Reeser stated he believed, would be found in the application of some practicable form of unit operation. The present conservation or proration methods, he stated, will increase the cost of production until competitive operations are displaced by unit operations, present prices for crude and its products are now remunerative, he added.

The three factors in the present oil situation which he deemed most important for oil company ownership and management to note are as follows:

"1. The petroleum industry at this time faces a condition it has faced only once before in its history, namely, the almost certain prospect that, during the coming six months' period, there will be a very small, if any percentage increase in the demand for its principal money product, gasoline.

"2. The excess of all liquid petroleum products at any given time is the difference between the aggregate of all stocks actually on hand and the aggregate working stocks necessary to meet current demand. It follows, therefore, that the economic lesson is to dispose of, or to reduce, the excess until a balance is reached.

"3. The necessity for quickening effort to find, as promptly as possible, the effective and permanent solution of the industry's major problem of how to prevent recurrent periods of overproduction of crude oil, which remain the root of the evil."

Absolute stoppage of waste of gas in the oil and gas producing districts of the country is the remedy for the present situation in the oil industry, it was suggested by C. B. Ames, vice-president of The Texas Co., in speaking before the institute group session on Unit Operation. He prefaced this sugges-

tion with statistics showing that the total consumption of gas for all purposes was more than 5,000,000,000 cubic feet daily, of which total consumption for domestic purposes was less than 1,000,000,000 feet, and 2,000,000,000 feet were being blown into the air. Nearly all this waste is taking place in three states, said Mr. Ames.

"Under the established law of the land, each state has the power to stop this waste, and it is well to inquire what the effect would be if the states should exercise this power," said Mr. Ames.

"IN THE first place it would stop this terrible waste of an exhaustible and irreplaceable natural resource. The average price per thousand cubic feet paid by domestic consumers in 1929 was 62 cents and in the course of time there would be a market for every foot of gas now being wasted.

"In the next place, it would reduce the oil production. It is estimated that this gas which is being wasted is bringing to the surface more than 400,000 barrels of oil per day. In addition, the gas which is being wasted is producing enormous quantities of natural gasoline which are not needed at this time and which are contributing to the demoralization of the industry.

"A reduction of 400,000 barrels of crude per day and a reduction of the natural gasoline output derived from the wasted gas would have an immediate effect upon the crude situation of incalculable value to the industry.

"The diminution of the crude supply would result in better refinery practices in order to increase the percentage of gasoline recovered and reduce the fuel oil output. The effect of this would be to avoid flooding the market with fuel oil, thereby improving the price received and benefitting both the coal industry and the railroads.

"It would likewise reduce the enormous stocks above ground and thus bring the industry into a better statistical position.

"After a while, as the demand for crude increases, the gas which would otherwise be wasted would be returned to the oil sands for further use in the production of crude, thus increasing the ultimate yield by a figure which is estimated by some competent observers as 20 per cent of the total.

"The tendency also would be to discourage wildcatting, as there would be no incentive to discover new flush areas before there was a market for both the gas and oil."

Classifying unit operation as an alleviation of existing evils, rather than an effective remedy, Mr. Ames said that diversification of interest among surface owners was an obstacle in the way of its application.

"Under the law, a surface owner has the right to drill on his own land," he said. "This is a right of which he cannot be absolutely deprived. He cannot be forced into a unit operation and, therefore, unitization must rest upon consent and not upon compulsion, as the diversity of interest sometimes prevents consent, progress in unitization can only be made gradually and by persuasion."

Characterizing the chaotic conditions in the marketing branch of the industry as the direct result of overproduction of crude, Mr. Ames described these conditions as follows:

"Of all the branches of the industry, marketing is in the worst condition, and in it there has been the least progress. The code of marketing practices has been helpful, but there has been such an enormous oversupply of products that the marketing end of the business has almost broken down.

"THE sales departments of the various oil marketing companies and the Independent wholesalers and retailers of gasoline seem to be engaged in a mad struggle for volume without regard to either value of the product or profit in its distribution. It is not unusual for the oil companies to produce crude, transport it to their refineries, refine it and sell the gasoline for less than some of the dealers receive for distributing it through their stations."

Commenting on the progress made by the industry, through the institute, in putting current refining statistics before its operating heads promptly, W. M. Irish, president Atlantic Refining Co., chairman of the institute's Division of Refining, said that existing current statistics should be expanded and sectionalized. This was in his general report before the group session on refining.

"Each of us must know the conditions in the area in which we operate and our own relation to such conditions," said Mr. Irish in developing this suggestion. "The collection and use of figures by the institute should be developed as an aid in seeing into the future, not only with respect to production and consumption of crude and products, but also as to costs and profits."

W. N. DAVIS, Phillips Petroleum Co., Bartlesville, Okla., chairman of the institute's Division of Production, commented upon the proration programs in his report before the group session on production. He said:

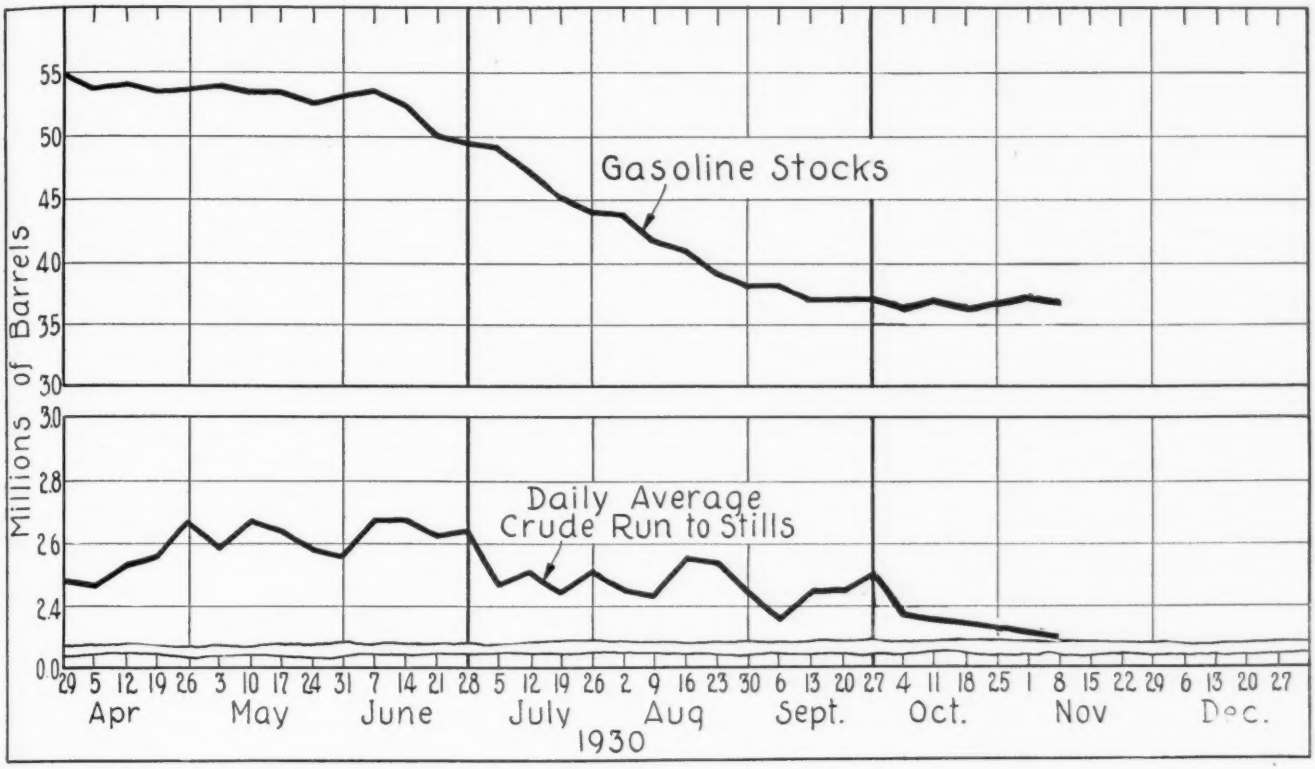
"The full measure of stabilization which might have been expected to result from the constructive action of the producers has not been realized, partly because of the large crude stocks on hand, but chiefly because the refiners of the country overestimated the coming demand and built up excessive stocks of gasoline."

"There is another reason why the producer has not reaped the reward which it would seem he had earned," he said at another point.

"The producer who curtails his production to his prorata part of the indicated current demand has a right to expect a stable market as the natural result of a balanced condition which he has helped to create. But if his production is so located that there is but one available purchaser, and this purchaser cuts the price, he must choose between shutting in his production and shutting off his income or contributing to general demoralization by selling below the prevailing competitive market price.

"Thus proration has failed in one of its primary purposes, stabilization, and will continue to do so unless there shall be a competitive market available for all oil produced when the aggregate current production has been curtailed to the indicated current demand."

U. S. Crude Runs and Gasoline Stocks as Reported Weekly by A. P. I.



Gasoline Stocks Fall 203,000 Barrels

By Telegraph

NEW YORK, Nov. 11

GASOLINE stocks were reduced by 203,000 barrels for the week ended Nov. 8 at U. S. refineries reported to the American Petroleum Institute. Fuel oil stocks increased by 606,000 barrels and crude runs to stills were down 7000 barrels daily average.

All major refining districts reduced gasoline stocks excepting California which increased by 206,000 barrels. East coast stocks were down 61,000 barrels; Indiana-Illinois 157,000; Oklahoma-Kansas 169,000 and Texas 112,000 barrels.

Fuel oil stocks were down in all districts excepting Texas.

Heavy reductions in crude runs to stills in California and Louisiana-Arkansas offset increases in other districts. California cut runs 12,700 barrels daily and Louisiana-Arkansas by 12,100 barrels. Total Texas runs were up 11,800 barrels, while the Gulf coast refiners in Texas advanced runs by 21,900 barrels.

Percentage of reporting capacity operated last week was slightly lower than for previous week; 64 per cent being operated in week ended Nov. 1 and 63.8 per cent for week ended Nov. 8.

Current Refinery Operations

Districts	Per Cent Capacity Reporting	Daily Average Crude to Stills (Barrels) Week Ended		Per Cent of Reporting Capacity Operated Week Ended		Stocks (Thousands of Barrels) Gasoline		Gas & Fuel Oil	
		Nov. 8	Nov. 1	Nov. 8	Nov. 1	Nov. 8	Nov. 1	Nov. 8	Nov. 1
East Coast	100.0	482,000	479,000	78.7	78.2	5,705	5,766	11,878	12,280
Appalachian	93.2	73,400	76,100	55.7	57.8	824	820	990	1,029
Ind., Ill., Ky.	97.5	236,900	235,700	62.2	61.9	4,471	4,628	3,946	3,991
Okla., Kans., Mo.	89.4	248,100	241,000	60.2	58.5	2,215	2,384	4,577	4,601
Texas	91.9	522,300	510,500	70.2	68.7	6,450	6,562	10,558	10,449
La., Ark.	98.3	148,600	160,700	56.7	61.3	1,217	1,041	2,062	2,252
Rocky Mountain	93.1	44,300	46,900	31.7	33.6	1,532	1,622	1,027	1,041
California	98.3	519,000	531,700	58.7	60.2	14,598	14,392	103,982	103,983
Total	95.6	2,274,600	2,281,600	63.8	64.0	37,012	37,215	139,020	139,626
Texas (Gulf Coast)	100.0	410,300	388,400	77.5	73.4	5,242	5,275	7,787	7,636
La. (Gulf Coast)	100.0	106,300	106,600	72.1	72.3	991	815	1,105	1,301

California and Gulf Gasoline Replace Shell Imports

CHICAGO, Nov. 10

THE Royal Dutch-Shell group will during 1931 reduce by about half its imports of Venezuelan gasoline, replacing those requirements for its East Coast organization with California and Gulf Coast gasoline. F. Godber, director of the Royal Dutch Shell Group, issued this statement:

"Considerable misunderstanding seems to have arisen in regard to the imports by the Shell Union of petroleum products from Venezuela. Certain interested parties who have apparently not taken the trouble to analyze the figures in order to secure for themselves the true position are claiming that imports from Venezuela are largely responsible for the present very low prices on the domestic market. We cannot speak for other importing companies, but we do know that these imports, so far as the Shell Union is concerned, have no bearing upon the domestic market.

"The facts are that Shell Union has a distributing organization on the East Coast of the United States, which it has built up to provide an outlet for its production in California and the Gulf Coast. This contemplated, in line with the policy of other American companies, the shipment by sea of supplies to the East Coast so that, in addition to the gasoline marketed on the Pacific Coast and the Midwestern and Gulf markets, its entire sales organization throughout the United States would be supplied with gasoline produced from crude obtained and refined in its entirety within the United States.

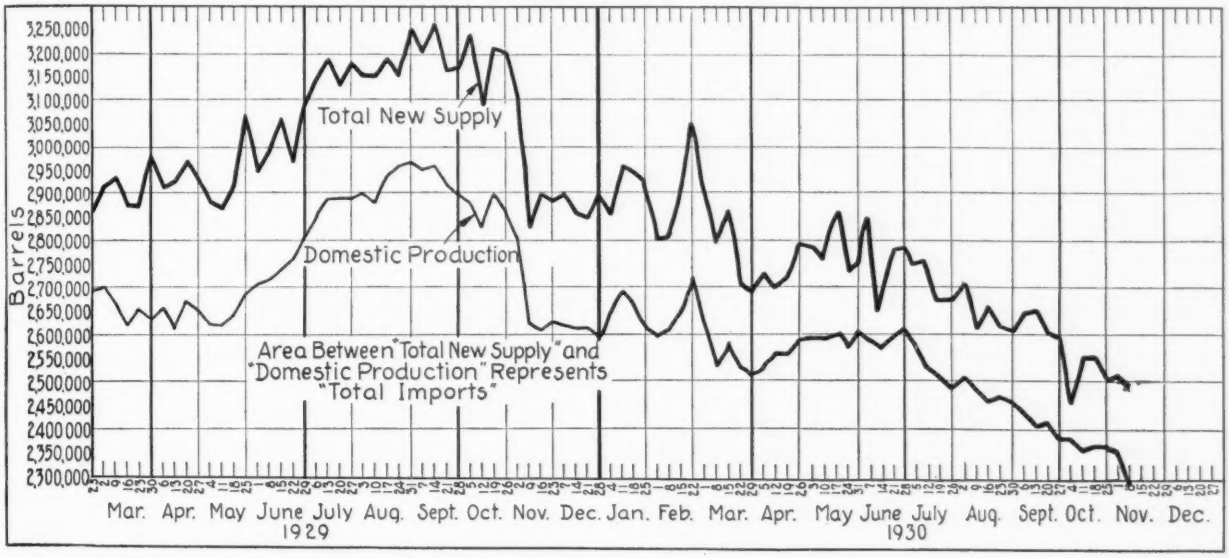
"Certain freight disadvantages to this plan, however, induced us to ship our California and Gulf supplies to Europe and elsewhere instead of to the East Coast and to import in substitution, approximately equivalent quantities from Venezuela to the East Coast so that, in effect, an exchange gallon for gallon of Venezuelan for American oil took place and the domestic market remained unaffected. This is quite clear because if, as has been suggested, our imports of Venezuelan gasoline were to be diverted to Europe and our California and Gulf supplies shipped to the East Coast, the net quantities marketed by us in this country would remain the same. It seems, however, that, although the facts are well known to most interested parties, a persistent campaign has been launched to mislead the public so far as our group is concerned.

"For many years past, the group with which Shell Union is associated has consistently advocated conservation and has continually drawn attention to the inevitable consequences of the reckless and irrational development of the industry. The Royal Dutch-Shell have not only reduced their own production in the United States considerably below the decline for the country as a whole—the figures for California showing a decline of 32.1 per cent as compared with a decline of 21.7 per cent for the state as a whole; and for the Mid-Continent, Texas and Gulf Coast, a decline of 17.4 per cent as compared with a decline of 7.4 per cent for these states as a whole—but in addition the Royal Dutch-Shell has shut in very substantial quantities in Venezuela, Roumania, Dutch Indies and Mexico, amounting in all to not less than 18,000,000 barrels per annum, and if their proposals to conserve production in Venezuela had been proceeded with, they would have shut in a further quantity of 16,100,000 barrels per annum.

"IT IS quite obvious, therefore, that this group has already made sacrifices considerably in excess of most other companies in an endeavor to create more normal conditions within the industry as a whole. It still believes that substantial benefits to the public and to the industry can be realized within the near future if those interested in the industry will approach their problems from a broader angle, and whilst it is quite clear that so far as this group is concerned, a re-arrangement or a reduction of imports can not affect the domestic market, it is willing, in order to still further prove its desire to co-operate and to remove the prejudices which undoubtedly have been created, and subject to its being able to make satisfactory freight arrangements, to substantially reduce its imports of Venezuelan gasoline by approximately half the requirements of its East Coast organization so that to this extent the quantities of California and Gulf gasoline, which hitherto have been shipped to points outside of the United States, will during 1931 be shipped to the East Coast; whilst to the same extent Venezuelan gasoline, which has been imported to the East Coast organization, will be shipped direct to other points to take the place of the California and the Gulf products.

THE Royal Dutch-Shell Group continues in the strong belief that the crux of the whole situation is, that oil should be produced only within the limits of the demand, and that not only should crude oil come within this definition, but that refined products also be similarly included. For its part, it recognizes the efforts which have already been made in the United States and other countries, to which reference has already been made, and so far as the production in Venezuela is concerned, it reiterates its offer made almost twelve months ago that, provided other producers in Venezuela will accept the same undertaking, it is prepared to reduce its rate of production from fields in Venezuela compared with the rate of production in 1929 proportionately with any average reduction in the United States on the same basis. This offer has never been withdrawn, and it is clearly evident that the efforts of producers within the United States will be largely nullified unless production in Venezuela is similarly and proportionately reduced. . . ."

Review of Late Production News



Daily Average Crude Oil Production and Imports Based on Current Reports of American Petroleum Institute

NOT since the discovery of the Seminole field in 1926 has daily average U. S. production been as low as 2,297,250 barrels, which it was during the week ended Nov. 8, according to the American Petroleum Institute. This is a decrease of 65,800 barrels under daily average of the week ended Nov. 1. More than half of that decrease was in Oklahoma and the rest of it in Texas fields.

Crude oil imports were nearly 200,000 barrels daily average the last week, a gain of 47,000 barrels over the previous week, bringing total new supply to 2,496,395 barrels.

Oklahoma, Kansas

THE Mid-Continent was decidedly quiet during the past week. Most of the activity in the state of Oklahoma was in the new plays in the old Seminole area. It appears that two small pools are in the making. At Oklahoma City there were several comparative failures on the north though both ends of the pool were extended.

In Kansas the interest was centered in the discovery of Viola production two miles northwest of the Ritz Pool of McPherson county. The latest well in this territory is estimated as being good for about 3000 barrels and operators are hoping for another Voshell pool.

Current production in this country by pools is found on page 273

The Eastborough pool, just east of the city of Wichita, had four good completions and one failure. The west side of the pool continues to look good and may eventually get into the settled district of the city.

Texas, New Mexico, Louisiana

ARKANSAS FUEL CO.'S test three-quarters of a mile southeast of the C. M. Joiner and others discovery, in the Juan Ximines survey, northwestern Rusk county, East Texas, is showing mostly shale and little sand at 3591 feet, or the approximate depth of the Joiner 250-barrel well. If it makes a well, the Arkansas Fuel test will be smaller than the discovery. Spotted production of the type common to Woodbine sand areas is indicated for the territory.

In Midland county, West Texas, the No. 1 Mathena test of Kirwin and the Nordon Corp., in W. T. Gray survey 40, topped the salt marker formation of the Permian salt basin at 1610 feet, or 1116 feet above sea level. This is from 60 to 200 feet higher than three other wildcat tests previously drilled around it and six to 10 miles away.

Normal flush completions in "inside" territory have brought the unofficial potential of the Hobbs, New Mexico district to 1,000,000 barrels daily as compared with prorating outlet fixed at 31,500 barrels. Official prorating figures for the semi-monthly period exceed 900,000 barrels, potential.

California

SMALL uncurtailed production from new California fields together with an increase of nearly 3000 barrels per day in the Playa del Rey pool accounted for over 5000 barrels of flush oil added to the state's estimated daily average output over the week.

An additional curtailment in the Elwood field approximately equal to the increase at del Rey helped to balance the new oil that indicated an actual daily production of 599,200 barrels, 59,200 barrels above the proration goal.

Rumors were that curtailment would be made effective at Playa del Rey. Major interests have promised to post a price for crude from this field when and if the operators curtail their production.

I. O. M. A. Condemns Leasing Stations Under Code

Staff Special
ST. LOUIS, Nov. 6

LEASING of service stations as practiced by major oil companies under the code of marketing practices was condemned at the annual convention of the Independent Oil Men of America here this week.

A resolution was adopted at the business meeting Nov. 5 citing the leasing practice as a violation of the Clayton anti-trust act, of the Federal Trade Commission Act, and as a direct derogation of the code of ethics.

Support of the independent producers' efforts to obtain a tariff on crude imports was given by the I. O. M. A. also at the business meeting. A resolution endorsed "each and every lawful move or effort whereby tariff provisions may be had to prevent the further importation of foreign crude in a manner whereby it, or its products, may be supplied within continental United States at a price less than domestic produced crude and its products may be sold in the same territory and that such a tariff is hereby indorsed as will protect domestic production against foreign invasion."

The resolution against leasing cited that the code prohibits free concrete work, painting and installation of pumps and tanks, but that these prohibitions do not govern relations of a distributor having full control of a leased station. A great number of larger distributors were leasing stations purposely to avoid the code, the resolution charged, and that the smaller companies were not able to operate this system in competition with the big organizations.

Under present conditions, the resolution continued, of control and interpretation of code provisions many bad abuses have developed which seek to legalize such practices, and that these abuses are wholly unfair to the Independent since they use legal and proper methods to perfect a monopolistic tendency in favor of the larger companies. The condition was claimed to be general from the middle west to the Atlantic coast states.

Further business was to elect Frank Muench, Diamond Kerosene Co., Carlinville, Ill., as secretary-treasurer, to fill the vacancy caused by Paul Deer, Crawfordsville, Ind., who sold his business.

The highlight of the formal program was the address by J. Frank Grimes, president of the Independent Grocers' Alliance on "The Unused Power of the Individual in Business."

Resentment of the individual business man to accept and follow suggestions, against his desire to run his business as he saw fit, was the greatest difficulty confronting the Independent, Mr. Grimes said. His association has evolved a program complete in all details that would match the strongest competition, he said.

In telling of his organization Mr. Grimes said last year its sales exceeded $500,000,000, that over 350 newspapers were used weekly for advertisements; that members distributed a house organ of 2,500,000 circulation twice a month; and that aside from the percentage on purchases this service cost each grocer but $3.50 a week. Success of the plan was attributed to having complete details worked out, and making members comply with regulations.

Wirt Franklin, president of the Independent Petroleum Association of America, was unable to be present on account of duties in Washington and the oil gusher in Oklahoma City, but his place was taken by Russell B. Brown, executive manager and counsel for the organization.

Leadership was the lacking quality in America today, Mr. Brown said, but it can be developed through the Independent. The statement by Sir Henri Deterding, head of the Shell interests, last spring that there was no place in business for the small man was an affront to the industry, he said, and that since that statement Shell has passed its dividends.

Doherty Says He May Ask Inquiry of Oil

CHICAGO, Nov. 10.—That he intends to ask the federal government for a joint congressional investigation of the petroleum industry unless directors of the American Petroleum Institute formulate a program for relief of present conditions, such as he can approve, is the burden of a letter addressed to the A. P. I. directors by Henry L. Doherty, head of the Cities Service group of oil and public utilities companies.

This investigation is to be sought, Mr. Doherty's letter said, immediately after this week's A. P. I. meeting in Chicago. After accusing the industry of having no proper leadership and after saying "the men who have attempted to fix the policies of the industry have acted intemperately on a program born of impulse rather than thought, Mr. Doherty said further:

"If I cannot get any suggestion from the men in the oil industry that is workable, I feel it to be my duty, and I intend to act on it immediately after the convention in Chicago, of asking for a joint congressional investigation."

Mr. Doherty, who originally proposed compulsory unit operations of oil fields at the Fort Worth meeting of the A. P. I., about six years ago, said with regard to his charge of intemperance in oil industry leadership that "this even went so far as to produce a report on petroleum conditions that was so untrue and misleading as to be nothing less than grotesque and at one of the hearings held by the Federal Oil Conservation Board one of the principal speakers of the industry delivered an impassioned address, intended to intimidate the Federal Oil Conservation Board from taking any steps in the matter . . . ."

Standard Viscosity Test Oils Now Available from A. P. I.

CLEVELAND, Nov. 7

TWO new standard test oils, for the standardization of Saybolt Universal and Saybolt Furol viscosimeters, have been prepared and standardized by the Committee on Viscosity Standards of the American Petroleum Institute, according to information received from Dr. T. G. Delbridge, of the Atlantic Refining Co., chairman of the committee.

The preparation and offer for sale of these standard test oils is the result of the reorganization of the committee under Dr. Delbridge during the first part of this year, and cooperative work undertaken under his supervision looking toward supplying these much-needed standards. Heretofore refinery laboratories have found it necessary to send viscosimeter tubes frequently to the U. S. Bureau of Standards for calibration, which laboratory is the only one in this country which is equipped for, and especially fitted for this work. With these new standard oils each refiner can now calibrate his own instruments, avoiding the necessity and the expense of such frequent sending of tubes to the national bureau.

The announcement, giving the details of the standards available, their purpose, and the manner of obtaining them, is given in full below.

The Committee on Viscosity Standards of the American Petroleum Institute is now prepared to furnish two oils for viscosity standardization purposes. Viscosities on each of these oils have been accurately determined by each representative on the committee, which includes the Bureau of Standards. All members agree well within one-half of one per cent. The two viscosity standards are designated as "A.P.I. Alpha," suitable for Saybolt Universal viscosity at 100° F., and "A.P.I. Beta," suitable for Saybolt Universal at 210° F., and for Saybolt Furol at 122° F. Accurate results with these samples require strict adherence to A.S.T.M Standard Method D88-30 as to both apparatus and procedure.

These oils will be shipped in glass by express collect, the price being $5 for each quart sample and $10 for each gallon sample. Application should be accompanied by check drawn to the order of "T. G. Delbridge, Chairman, Committee on Viscosity Standards" and should be addressed to 3144 Passyunk Ave., Philadelphia. The Committee reserves the right to decline acceptance of applications without further notice.

The personnel of the Committee is as follows: Dr. E. W. Dean, Standard Inspection Laboratory; Dr. W. H. Herschel, U. S. Bureau of Standards; Dr. K. G. Mackenzie, The Texas Co.; Dr. L. W. Parsons, Tide Water Oil Co.; Mr. E. B. Phillips, Sinclair Refining Co.; Dr. J. B. Rather, Standard Oil Co. of N. Y.; Dr. J. B. Terry, Standard Oil Co. of California; Dr. H. V. Hume, (Secretary) The Atlantic Refining Co.; Dr. T. G. Delbridge (Chairman) The Atlantic Refining Co.

Suggests Advance Buying To Aid Unemployed

WASHINGTON, Nov. 10.—L. J. Drake, president of the Union Tank Car Co., in a letter to Capt. J. F. Lucey, president, Lucey Petroleum Co., Dallas, Tex., has suggested that as aid in relieving employment that companies place orders with foundries and manufacturers for a six months' supply of materials needed for repairs, materials to be paid for as delivered and the suppliers to guarantee the buyers against any decline in price in the coming six months.

Mr. Drake said he had been discussing the plan with his associates with the idea of putting it into effect at an early date. He said that in checking over inventories in store rooms at the company's various repair shops he had found that the supply of materials needed for repairs to the company's cars had been reduced to a minimum.

Receivers Appointed For Cosden Oil

CLEVELAND, Nov. 11.—Hugh M. Morris, Wilmington, Del., and George N. Moore, Fort Worth, were appointed receivers of the Cosden Oil Co. in United States district court at Wilmington Nov. 10.

Appointment of receivers followed presentation of claim for $17,735 by the Merrick Drilling Co. for drilling a well. The Cosden company said it was unable to pay current debts although the company was solvent. It stated its assets to be $12,812,000 and liabilities, exclusive of corporate stock, to be $4,330,000.

The company was organized in 1928 by J. S. Cosden in his comeback in the oil industry.

Receiver Appointed For Joiner Leaseholds

HOUSTON, Nov. 8.—Ernest R. Tennant, Dallas banker, has been appointed receiver for leaseholds in Rusk county belonging to C. M. Joiner and certificate holders who aided financially in Joiner's drilling of the discovery oil well northwest of Henderson. About 500 acres of leaseholds are affected, including the 80-acre discovery tract.

Certificate holders sought a receiver and Joiner filed a cross action also asking for a receiver. Certificates of interest were issued to different persons in raising funds to complete the well, but Joiner sets forth these affect only a small part of his total holdings.

The Joiner well, completed at 3592 feet in Woodbine pay in the Ximines survey of northwestern Rusk county, has been producing intermittently at various rates between 200 and 300 barrels daily.

Kansas Refiners May Get Cut In Oil Freight Rates

WASHINGTON, Nov. 7 OIL rates from Kansas refineries to certain consuming points in the Middle West may be reduced as a result of the new order of the Interstate Commerce Commission in the Mid-Continent oil rate case of 1925.[1] Either this must be done or Oklahoma rates must be raised to create the full differential ordered by the commission.

General opinion is that the railroads will not raise Group 3 rates, particularly now that pipeline competition in the shipment of gasoline is so near.

For a clear understanding of the commission's new order it is necessary to recall a few facts about the famous case:

The fight was primarily about the relationship and not about the level of the rates. The rate body established rates from Group 3 to key points. Then it told the railroads to make rates from Group 2, Kansas, and groups to the south and west of Group 3 either over or under Group 3. Among the key rates authorized as a maximum was one of 39 cents from Tulsa to Chicago.

Then the commission prescribed graded scales of differentials to be used in making the rates to intermediate or related points. The Kansas City group, No. 1, rate to Chicago was to be 7 cents under Tulsa and the Group 2 rate was to be 2 cents under Group 3.

But the influence of Group 3 refiners was so great that the railroads decided that they would not take the increase they might have taken. They kept the Tulsa-Chicago rate 36 cents instead of making it 39. Then lines through Kansas City and Omaha decided that they wanted to keep in the Tulsa-Chicago trade so they refused to take the 39 cent rate. When they came to establishing rates at points on the routes through Kansas City and Omaha to Chicago they established the rates allowed as maximum from Tulsa at all points possible without violating the long and short haul part of the law. They asked for permission to violate that but their request was denied.

But they ignored the mandate to make Group 2 rates specified amounts under the Group 3 rates. According to the allegations of the Shell Petroleum Corp., the railroads failed to observe the relationships at points in Iowa, Wisconsin and Michigan, particularly Fort Dodge, Ia., Madison and Wausau, Wis. and Menominee, Mich.

The Kansas Oil Traffic Committee said that the rate to Fort Dodge was held at 34 cents, or 2 cents under the Tulsa-Chicago rate notwithstanding that the order required the rate from Tulsa to Fort Dodge, in accordance with the requirement of the rate relationship part of the freight rate body's order, to be 2.5 cents under.

Fort Dodge is declared to be typical of dozens of other places between key rate points, to the prejudice of shippers from Group 2 refineries, at a time when the margin that turns a sale of gasoline is so thin that it is transparent.

Unofficial information that has come to the commission since the issuance of the supplemental order requiring observance of the exact terms of the differential part of its order is to the effect that the railroads will probably comply by reducing the rates to points in Iowa, Wisconsin, Michigan and other states where they have made their rates no higher than the level of the maximum rates but have failed to keep them low enough to give the proper spread between rates from Groups 2 and 3.

Any other course would result in an increase in rates from Group 3 to Chicago, a thing unthinkable to the railroads. They were threatened with the construction of pipelines when the report of the Commission came out. They believed the assertions of the refiners to such an extent that, in effect, they got down on their marrow bones and prayed to be allowed to keep the Chicago and the St. Louis rates at the old level because of a loss of business that would result from any increase.

Among the things threatened was the construction of pipelines from Group 3 to Group 2 stations so that Group 3 refiners would have the benefit of Group 2 rates. When those threats were made presidents and vice presidents of the railroads came down to Washington to testify in favor of an order permitting them to keep their rates down. Prior to that time subordinate traffic officers had testified in favor of higher rates.

[1] NATIONAL PETROLEUM NEWS, Oct. 15, 1930, P. 41.

Minority Holders Decry Independent Merger

By Telegraph

TULSA, Nov. 10.—Merger of the Independent Oil & Gas Co. and Phillips Petroleum Co., which apparently had become history, was thrown into the limelight Nov. 10 by the publication here of protests of some Independent minority stockholders. Legal action has been threatened.

Protest about the terms of the merger and the giving of 32,373 shares to Bancamerica-Blair Corp., which engineered the deal, were made by W. L. Kister, Tulsa, and P. D. Ball and L. C. McEvoy, St. Louis. It was contended at a meeting of Independent stockholders here Nov. 8 the exchange basis should have been 120 shares of Phillips for 100 Independent instead of 77 shares of Phillips for 100 shares of Independent.

J. H. Hudson, counsel for Phillips, issued a statement saying when the Independent-Phillips merger plant was presented to the Independent stockholders originally there was not a vote against it. The Nov. 8 meeting here, he said, was to consider dissolution of Independent and distribution of its assets.

Kansas, Oklahoma City, Get Further Production Cut

TULSA, Nov. 8

CHIEF events in proration work of the Mid-Continent the past week centered upon Kansas. Prairie Oil & Gas Co. announced Nov. 7 that effective Nov. 10 it would put into effect the Oklahoma plan on properties from which it is buying oil in Kansas. This, it said, includes its own leases.

In all Kansas areas except in the Voshell, Ritz, Wright and Raymond pools, which are under proration already, the Prairie will employ the Oklahoma plan of prorating wells averaging more than five barrels daily. The excess of this marginal amount will be prorated 50 per cent.

Prairie also announced a reduction in takings from other pools already under proration. Its purchases in the Voshell pool are cut from 2300 to 1200 barrels daily and in the Ritz from 1968 to 1000 daily. The Raymond pool will be served by this company to the extent of 550 barrels per day. No change was made in the Wright, or Valley Center pool.

With decreased buying, it was necessary during the week for the umpire to make a new canvass of the Kansas situation and set up new allotments. The Ritz pool, with potential of 15,050 barrels, is now prorated to 42 per cent and the new wells that are soon to come in will take a deeper cut.

The Voshell pool, rated as capable of producing 68,681 barrels, has outlet for only 9.422 per cent, or 6100 barrels. Only two wells are drilling, although there are many locations certain to produce.

The congestion in field storage in the Oklahoma City pool led to a revision of the proration order by the state corporation commission on Nov. 4. It provided that all wells in the pool which have served their 65-day shut down time, shall be held to four hours production in each 12-day period until such time as the under-produced wells produce and market the amount of oil they are entitled to under the former order which permitted eight hours production in 12 days.

New wells are cut to eight hours testing period, instead of the 24 formerly allowed. After flowing eight hours they must be shut in for 65 days.

All over-produced wells are to be shut in entirely until they are even with the schedule. Then they go on the four-hour in 12 days basis.

Wells previously entitled to produce 24 hours after drilling in and which have not been able to produce that time because of pipeline congestion and lack of storage, are, under the new order, considered as evenly produced until the production in the pool is equalized.

Legally produced oil in tanks —under-run production—is declared to be oil which the producer is entitled to run.

Congestion is so great that it is estimated this new order will apply until at least Jan. 1.

Complaint was filed by Umpire Bradford against the Marco Oil & Royalty Co., one of the concerns that is operating on town-lot acreage, for violation of the proration order and citation was issued by the corporation commission. It is charged that the company's well has been operated nearly every day since it was completed a month ago.

Choked Potentials of Van Field Exceed 350,000 Barrels

HOUSTON

THE 150 wells completed in the last 12½ months in the Van district of Van Zandt county, East Texas, are credited with more than 350,000 barrels potential production daily through 11/16-inch chokers, with which all are equipped.

They are gauged on the basis mentioned for prorating purposes, to determine percentage "earnings" of individual wells against an existing market outlet of 27,500 barrels daily. Of the total, 130 wells are in the unit arrangement sponsored by Pure Oil Co., discoverer of the field, and 20 are in the non-unified northeast extension area, approximately two miles from original development.

At present, the unit area is prorated into the total outlet on approximately a 23,000 barrels daily basis and the non-unit area is prorated into 3500 barrels maximum.

Under open flow conditions, which have never been permitted at Van, potentials are considered to exceed 1,000,000 barrels daily.

Under the unit plan affected after completion of the Pure Oil Co.'s Jarman discovery well, Oct. 14, 1929, acreage contributions then made earned for the Pure its present 81.7 per cent of the cooperatively developed area. Humble Oil & Refining Co. drew 7.75 per cent; The Texas Co., 4.51 per cent; Sun Oil Co., 3.57 per cent; and Shell Petroleum Corp., 2.47 per cent.

Recovery calculations will continue on the present basis of acreage contributions to the 5800-acre block until May 1, 1932 when a revaluation of leases will take place to provide adjustments to be reached on engineering data. Again, Nov. 1, 1934 it is proposed to readjust values.

A total of 27 operations are under way in the immediate area of the Van field, four of which are new locations on Pure Oil Co. acreage, required by leasehold provisions.

SAN FRANCISCO—R. L. Marek, associate petroleum engineer, has returned to the Bureau of Mines offices here after a trip through the Mid-Continent on safety work.

Development of Standard Knock Test Method Progressing Rapidly

By T. A. Boyd*

(Presented before American Petroleum Institute, Chicago, Nov. 11-13)

THE first concern of the subcommittee on Methods of Measuring Detonation was that of providing an apparatus which would put everyone on the same basis in respect to the first important item. They accordingly pooled their experiences in the measurement of detonation, and on the basis of the result drew up specifications covering what they believed to be the essential features of a tentative engine. Both a variable-compression and a fixed-compression model were included.

Engines conforming as closely as possible to these specifications were then designed by H. L. Horning, and a small number were built in his factory and distributed to the laboratories of the subcommittee members. A description of these engines in the form in which they existed at that time was given by Mr. Horning in a paper presented at the annual meeting of the American Petroleum Institute a year ago. Since that time a large amount of experimentation has been done with both types of this engine.

As is usual with new mechanical equipment, the experiences of these various tests pointed to certain changes that it appeared desirable to make in the engine. The concrete suggestions of each member of the subcommittee have been submitted to Mr. Horning. He has tabulated these, and is now engaged in incorporating into the engine such of them as are consistent with good design and with the plans for a knock-testing engine that is expected to have universal application.

With respect to the changes that have been suggested, it should be said that none of them relates to the fundamental character of the engines, which in the main appears to be suitable for the purpose. Since none of the suggested modifications are of a fundamental nature, it is hoped that approval of a tentative engine can be made now before long. The elements of cheapness, ruggedness and dependability are being kept uppermost in the engine development.

Besides the engine, there are three accessories which are especially essential to a knock-testing apparatus: 1, a means of carburetion; 2, a power-absorbing medium; and 3, an indicating device. A great deal of experimentation has been done by the subcommittee on each one of these items also.

Carburetor

The importance of the first of these, a suitable carburetion system, arises from the large influence of mixture ratio upon tendency to knock. This is illustrated by the chart, Fig. 1. The solid curve on this diagram referred to the scale at the left is in terms of compression ratio for incipient detonation, as determined by ear. The broken curve referred to the scale at the right is in terms of the compression ratio required to give a constant gas evolution of 0.65 cubic centimeters per minute by the bouncing-pin indicator. Both curves show the same thing, viz., that a variation in mixture ratio over the ranges shown by the horizontal scale produced a variation in knock rating equivalent to the effect of 1.0 cubic centimeter of lead tetraethyl per gallon.

*The membership of the sub-committee is as follows:

D. P. Barnard, Standard Oil Co. (Indiana), Whiting, Ind.

T. A. Boyd (chairman), General Motors Corp., Detroit, Mich.

H. K. Cummings, Bureau of Standards, Washington, D. C.

H. C. Dickinson, Bureau of Standards, Washington, D. C.

Graham Edgar, Ethyl Gasoline Corp., Yonkers, N. Y.

J. Bennett Hill, The Atlantic Refining Co., Philadelphia, Pa.

H. L. Horning, Waukesha Motor Co., Waukesha, Wis.

Neil MacCoull, The Texas Co., New York, N. Y.

C. B. Veal (secretary), Society of Automotive Engineers, New York, N. Y.

THREE things are essential to a uniform method of measuring the anti-knock qualities of fuels; first, a standardized engine and accessories; second, a common reference fuel or scale of fuels; and, third, a uniform procedure.

The first of these, an engine, has been designed and built; and by comprehensive cooperative tests it has been found to be, in the main, suitable for the purpose. Development work is being done on the three essential engine accessories; means of carburetion, power-absorbing media, and instrumentation.

The second item, a reference scale, has been tentatively settled upon by adopting as recommended practice the use of mixtures of normal heptane, a hydro-carbon of low anti-knock quality, and *iso*-octane, a hydrocarbon of high anti-knock quality.

A large amount of experimentation has been done on the item of method, but no specific procedure has yet been adopted.

It is thus essential to accuracy in the measurement of detonation that the knock-testing apparatus be equipped with a suitable means for adjusting mixture ratio, and also that the metering of successive charges be just as uniform as possible. Some of the carburetor problems, particularly that of uniform metering, are harder to solve for a single-cylinder engine than for a multi-cylinder one.

The important matter of developing a suitable system of carburetion for the knock-testing engine has been delegated to a group with special capabilities in that field.**

Power-absorbing Media

The problem of the second essential accessory, a suitable power-absorbing medium, cannot be finally solved until the specific method that is to be used for measuring detonation has been settled upon. Nevertheless, enough information and experience have already been obtained to make it appear that, when the time comes to do so, the matter of deciding upon a suitable means of absorbing the output of the engine will not be a difficult nor a time-consuming one.

On account of especial suitability for controlling engines during general experimental work, electric dynamometers have thus far been used as a power-absorbing media in this development. However, the conventional electric dynamometer is perhaps too expensive and requires too much in the way of auxiliary equipment to be suitable for incorporation into the ultimate knock-testing outfit.

One very desirable, and for most methods quite essential, characteristic of a power-absorbing medium for use in knock-testing is a means of controlling engine speed and of holding it substantially constant. In the effort to take some of the burden of speed control off the operator, as well as to get a more exact regulation of speed, a considerable amount of experimentation has been

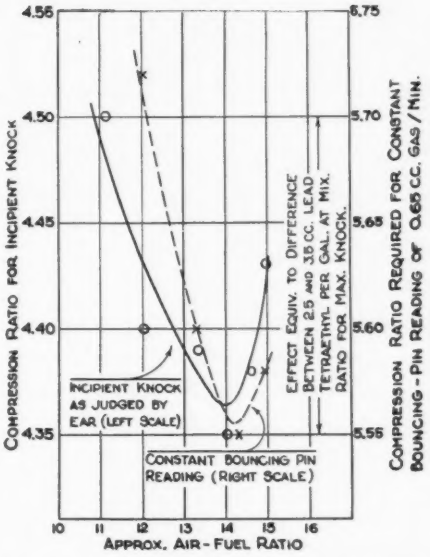


Fig. 1—Effect of mixture ratio upon knock

done with such power-absorbing media as water dynamometers, synchronous motors, and induction motors. The latter have usually been run at only a fraction of their total capacity, so that the variation in slip with small changes in engine output is practically negligible. They therefore, run at substantially constant speed.

The water dynamometer did not work out so well in this respect, but either form of the constant speed electric motor does take the burden of speed control off the operator, and so both simplifies knock-testing technique and helps to make the measurement of detonation more rapid. Without special provisions for it, these motors are not adapted for measuring engine output, only for absorbing it. But, if the method of test finally settled upon should require engine power to be measured, the ability to do so could be obtained by cradling the motor used and making such other provisions as are necessary.

Instrumentation

The third essential accessory to a knock-testing apparatus, some form of instrumentation, is one that much work is being done on both by the detonation subcommittee and by others. No decision on the item of instrumentation has been reached as yet, however; for instrumentation is closely tied up with method, and the method must necessarily come after the engine. Instrumentation is so intimately associated with method that the method of test which it is best to use may ultimately hinge in part upon the state of progress in the development of instrumentation.

The recent work on indicating devices referred to has consisted chiefly of the development of the "listening post" described by Mr. Horning in his paper a year ago[1] of improvements in means of measuring manifold depression, and of the further development of the bouncing-pin indicator, including the incorporation into it of an instrument for obtaining a direct reading of the degree of detonation, as distinguished from the customary method of measuring the gas evolved in an electrolytic cell within a given time.

Reference Scale

Following the item of apparatus just discussed, the next essential to a uniform method of knock rating is a common scale of reference fuels. This second item has been settled upon in a tentative way by agreeing to use normal heptane and *iso*-octane (2, 2, 4-trimethyl pentane) as primary standards.[2] Mixtures of these two hydrocarbons form a scale of anti-knock quality, the use of which has been approved as recommended practice by the Cooperative Fuel Research Steering Committee.

By the plan adopted, the anti-knock values of fuels are to be expressed in terms of octane number. *Octane number has been defined to mean the percentage of iso-octane by volume in the mixture of iso-octane and normal heptane required to match the anti-knock value of any given fuel.* The chart, Fig. 2, shows for one single-cylinder engine how octane number relates to permissible compression ratio, or to compression ratio for incipient knock. The numerical values of permissible compression ratio are related to octane number will vary with different engines, of course.

**This group is composed of D. P. Barnard of the Standard Oil Co. (Indiana) (chairman), D. B. Brooks of the Bureau of Standards, and the following carburetor experts who have consented to assist in this work: O. C. Berry of the Marvel Carburetor Co., S. C. Kegerreis of the Tillotson Manufacturing Co., and F. C. Mock of the Bendix Aviation Corp.

1. Tenth Annual Meeting Proceedings, Amer. Pet. Inst., p. 32.

2. Edgar, "Measurement of Knock Characteristics of Gasoline in Terms of a Standard Fuel," *Ind. Eng. Chem.* 19, 145 (1927); Edgar, "Detonation Specifications for Automotive Fuels," *J. Soc. Automotive Eng.*, 20, 245 (1927); Campbell, Lovell, and Boyd, "Detonation Characteristics of Some of the Fuels Suggested as Standards of Anti-knock Quality," *J. Soc. Automotive Eng.*, 26, 163 (1930).

Those presented in Fig. 2 are only for the purpose of illustration.

The thought is not that those laboratories which already have a scale of anti-knock quality should at once abandon it in favor of this new octane number scale at all, but rather that everyone should establish the relationship between his own scale and this one which is expressed in terms of octane numbers, in order that all investigators may be enabled to get on a common basis of reference, or that all may begin to talk a common language. It is recognized that, since the method and the conditions of test have a considerable influence upon the results obtained, determination in terms of octane number may be only approximate for the present. But when both a definite apparatus and a specific method of test shall have been settled upon, it is expected that this difficulty will be largely or altogether overcome.

An effort is also being made to provide secondary fuels of designated octane numbers, in order that uniform reference fuels may be available in amounts adequate for routine work. This plan involves obtaining and making generally available one stable gasoline of low anti-knock quality and another of high. These two fuels would either be adjusted each to some definite octane number, or else the values that they happened to have would be designated in terms of octane numbers.

Anti-knock values corresponding to any desired octane number lying between those of the two secondary reference fuels could then be obtained by proper mixtures of the two. Putting this plan into effect has been delayed by the inability to find a suitable source of a stable gasoline that is good enough in anti-knock quality to form the upper end of the scale.

Method

The third essential to a uniform method of knock rating, as mentioned at the outset, is a common procedure, or method of making measurements. With respect to this very important item, the subcommittee has recognized from the first that selection of the best procedure or method of measuring detonation should be made with the utmost care, and only on the basis of adequate cooperative tests.

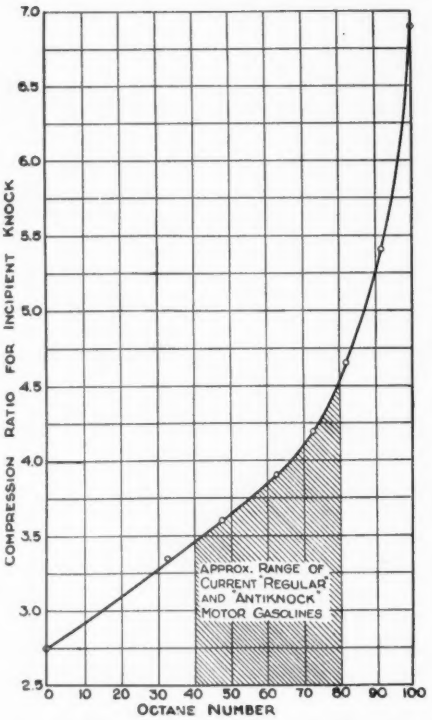


Fig. 2—Octane Number vs. Compression Ratio—Illustrative only—applies quantitatively to but the one engine used. Data from Jour. S.A.E. 26, 163 (1930)

As a means of determining the suitability of the engine, two comprehensive series of cooperative tests have already been carried out on a number of fuels which covered a range of anti-knock quality. In these tests a number of different methods were employed by each investigator, all under conditions as nearly uniform for each as they could well be made The procedures employed were not chosen as those from which a selection would ultimately have to be made, but rather as a group of representative methods that were adapted for use in the development of a suitable engine and apparatus, which is the thing that has been the main objective of the work thus far.

The various methods that were employed in the cooperative tests which have been made in connection with the development of apparatus are enumerated in brief below:

A—*Throttle opening methods.*

1. In which the point of incipient detonation was judged by ear, and the items recorded were:

(a) Degrees of throttle opening.

(b) Manifold vacuum as indicated by manometer depression, and

(c) Horsepower developed.

2. In which the point of a "standard" degree of detonation was judged by the listening post (2) and the items recorded were, as before:

(a) Degrees of throttle opening,

(b) Manifold vacuum as indicated by manometer depression, and

(c) Horsepower developed.

B—*Spark advance methods.*

1. In which the spark advance at incipient detonation was judged by ear.

2. In which the spark advance at a "standard" degree of detonation was judged by the listening post.

3. In which the spark advance for the point at which power just began to fall off was determined with the aid of a dynamometer.

C—*Variable-compression methods.*

1. In which the compression ratio was adjusted to the point of incipient detonation as judged by ear.

2. In which the compression ratio was adjusted to a "standard" degree of detonation as judged by the listening post.

3. In which the compression ratio was raised to the point at which power began to fall off as determined with a dynamometer.

D—*Fuel-matching methods.*

1. In which the quantities (a) of benzol and (b) of lead tetraethyl that had to be added to a common reference fuel to make its anti-knock quality equivalent to that of the fuel under test was determined with the aid of the listening post as an indicator.

2. In which the same points as in (1) were determined with the aid of the bouncing-pin indicator.

3. In which the same points as in (1) were determined by varying compression ratio to the point of incipient detonation as judged by ear.

Although no definite decision on the specific procedure that

should be selected has been made, nor can be made on the basis of the work done thus far, the results already obtained have indicated one point pretty definitely. This is that the highest degree of precision and the best agreement between different laboratories are obtained when the procedure involves the matching of fuels, or when it consists of the determination of anti-knock quality by comparison with, or in terms of, some common reference fuel. The results of this work are thus in confirmation of the importance of the second essential item of a uniform method of measuring anti-knock quality as enumerated at the outset, viz., a common reference fuel or scale of fuels.

Evaluation of Variables

As a means of placing the measurement of detonation on a firm foundation, the Bureau of Standards and each of the cooperating laboratories have been investigating the effects of the outstanding variables that may influence the measurement of detonation. These variables include such factors as speed, jacket temperature, compression ratio, spark timing, mixture ratio, fuel composition, intensity of detonation, and atmospheric conditions.

It is extremely important to have some specific knowledge of the way in which each of these variables affect detonation, because it has been found that certain of them may influence to a large degree the relative knock rating of one fuel with respect to another. Thus, a blend containing 40 per cent of benzene in gasoline may be found equivalent in tendency to knock to concentrations of lead tetraethyl in the same gasoline varying all the way from 3.4 to 7.0 cubic centimeters per gallon, depending upon what the setting of the spark is at the time the determination is made. Similarly variant results have been obtained also with different mixture ratios, and with different jacket temperatures.

These observations are especially significant in connection with methods of measuring knock, because fundamentally all methods are based upon a comparison with some reference fuel. Since the results of this comparison depend upon the conditions under which they are obtained, it is desirable that the specification covering the adjustment of these conditions be such as to reduce to a minimum the disturbing effect of engine variables. At the same time these conditions should correspond as closely as possible to those prevailing in actual practice on the road.

The investigation of the variables enumerated above is being carried on under an organized plan by which each one of the outstanding variables will be investigated by at least two different laboratories. The results of some of this work have already appeared in the literature,[3] and a symposium in which the most recent developments will be discussed is being organized for the coming winter meeting of the Society of Automotive Engineers. It is expected that a large amount of valuable information will be presented at that time.

Activity of Detonation Subcommittee

On account of the considerable time necessarily involved in getting the engines and accessory equipment designed, built and delivered to the respective laboratories, the most of the testing work of the subcommittee has been done during the current year. The effectiveness of the experimental work at the Bureau of Standards during the period has been largely increased by the supplementary contribution of $5000 made to the support of this work by a number of interested oil companies.

This endeavor differs from some of the previous work done under the auspices of the Cooperative Fuel Research Steering Committee in that, although as usual the experimental work involved is centered primarily in the endeavor at the Bureau of Standards, it is also being actively participated in at the laboratory of each one of the subcommittee members. Once a tentative apparatus can be approved, it will probably be made generally available at once without waiting for further developments. It is expected that thereafter the scope of experimentation on further phases of the problem within the two industries concerned will be greatly extended.

As giving some indication of the amount of work that has already been done within the Subcommittee on Methods of Measuring Detonation, it may be said that since its organization (and up to Sept. 15, 1930) the group has held 22 meetings. With very few exceptions, these meetings have been held at the time and place of some other gathering which has been attended by representatives of both of the two industries interested.

Following custom, the meetings of the subcommittee have been open to anyone who wished to attend; and they have been largely attended. One point in connection with the meetings of the subcommittee that ought to be mentioned is the faithful attendance of those who are members of it. Of the 22 meetings held, there was a perfect attendance at 16, and at none of the meetings were more than two of the members of the subcommittee absent.

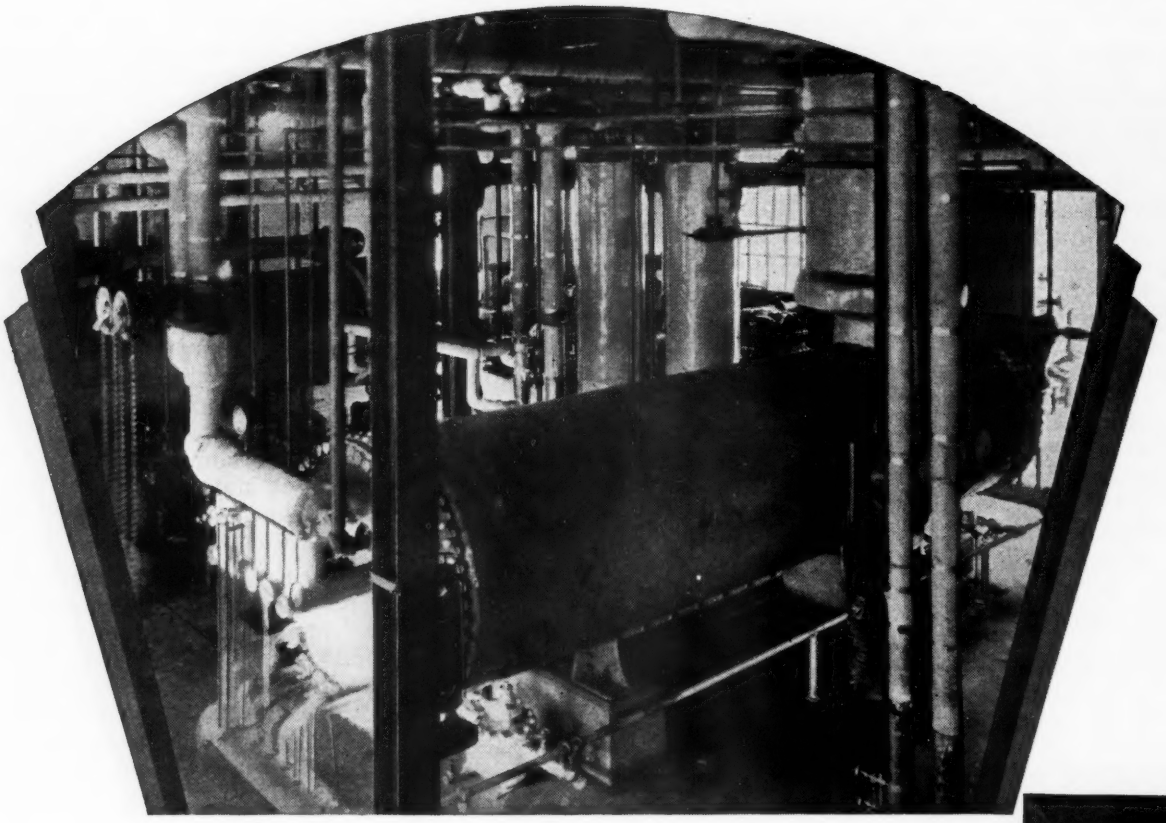
Cooperation Abroad

The subcommittee is fortunate in having the cooperation in this endeavor of a similar group in England. The British group is composed of the following key members: A. E. Dunstan of the Anglo-Persian Oil Co.; F. H. Garner of the Anglo-American Oil Co.; and J. Kewley of the Asiatic Petroleum Co. This group has appointed B. R. Jackson, who is located in New York as a representative of one of the British companies interested, as its representative on this side in order that through him they may contact as closely as possible the work of the American group.

3. Brooks, White, and Allen, "Atmospheric Conditions and Knock Testing," *J. Soc. Automotive Eng.*, 27, 56 (1930); Campbell, Lovell, and Boyd, "Importance of Mixture Ratio in Rating Fuels for Knock," *Ind. Eng. Chem.*, 20, 1045 (1928).

Australian Producers Organize

WASHINGTON—An association of oil producers has been organized recently in the state of Victoria, Australia, to promote cooperation and efficiency in oil prospecting. The association has issued the first number of its "Oil Bulletin".



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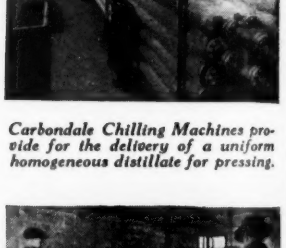
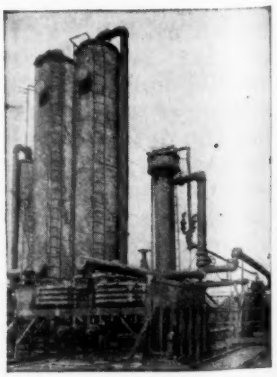


Carbondale Filter Presses and Filter Press Blankets.



Carbondale Heat Exchanger installation.

Carbondale Refrigeration CARMACO *for Refiners*

The Mid-Continent Skyline

By Lawrence E. Sm

AN OPEN LETTER

Mr. G. H. Taber, Jr.
Sinclair Refining Co.,
New York

Dear Mr. Taber:

I have been reading your ads in the popular periodicals and these big animals you show as the origin of your crude oil from which the Mobiline oil is made have attracted no little attention, not only on my part, but generally.

It comes as something of a shock to learn that if you folks picked out the choicest animals to supply your oil, what must some of this other stuff be made of? I'll admit that some of the oil I have used in my personal car couldn't have come from anything farther back in the geologic time scale than contemporaneous tom-cats or ground squirrels and some of the crude produced in West Texas must have been made, if your general hypothesis is correct, of recently defunct polecats. But, my opinion is that your general line of reasoning should be supplied with marginal notes saying that you do not vouch for the accuracy of the statements made, although you believe you are right.

The late Colonel Wood and myself always saw eye to eye on this ancient animal business. We agreed throughout that the mammals and reptiles shown in the museums of natural history over the country were fabricated by the local cementing contractors on such slender evidence as a two-inch fragment of a femur or clavicle. We doubted the time element supposed to be involved, being strict fundamentalists on that question.

Now, Mr. Taber, I want to call your attention to the little souvenirs which you folks handed out at the International Petroleum Exposition. Of course, I understand that you did not mean these to be exact replicas of the big creatures which you say were "Mellowed a Hundred Millions Years" to produce the kind of crude oil you use in making lubricants. For example, there couldn't have been any printing on the sides of these animals, such as you had on the rubber facsimiles. In the first place, there were no sign painters back then to do the work, and secondly, it would have been impossible to foresee that the Sinclair company would ultimately make use of the remains.

But, leaving out of the conversation the question of the printed matter, is it your serious contention that these animals were equipped with places to blow them up and rubber plugs to shut in the air after they were inflated? If you believe that, then there is no use in going into this matter any further. That sort of science will make a bolshevik out of anyone. If you don't believe it, then these dinosauer balloons are misleading the young.

If I were prepared to agree with you that oil originally came from such sources, I would still insist that you had picked the wrong locality. If you had made the assertions about Mid-Continent crude, it would sound more reasonable. Some of the oil in our tanks out here has been stored long enough to have originated right in the 55's and while it might be difficult for a dinosauer to get into one, owing to its height, there is enough space in the wooden roof for a 'sauer to jump out.

Well, Mr. Taber, aside from all that, I hope you are able to cash in on the ancient fauna you have unearthed. I haven't used any of your dinosauer oil as yet, but under the proper circumstances I might be induced to try some. You understand, of course, what I mean by this and there is no sense in being indelicate about it. I have never signed any testimonials yet, although I am in a receptive mood.

It has been my ambition for years either to be asked to endorse something, with photo in the papers, or to be offered a bribe. Either stamps a man as someone of importance.

It is my understanding that your oil "seals the power" or does something naive like that. Now I have a car whose power needs a bit of sealing. Recently it has been equipped with a rack over the hood so that a barrel of oil can be carried and a pipe provides continuous feed. It works fine as long as the barrel has oil in it.

Please continue publishing the animal pictures. They stimulate the imagination. But, for the benefit of us 100 per centers, you might state that none of the varmints were native to Venezuela or any other foreign place where oil is being produced and imported, duty free.

Yours sincerely,
ELLICK BOTTS,
Consulting Pumper,
Gray Horse, Okla.

* * *

Sinclair Oil & Gas Co. has organized a scouting department. Ever since the Standard Oil Co. of Indiana joined the Sinclair Consolidated in setting up the Sinclair Crude Oil Purchasing Co., the scouting organization was maintained by this latter unit. Now that the Indiana company owns the crude purchasing company, Sinclair is forming its own scouting department. Ralph Steinman is chief scout. He was one time chief of the department for the Sin-

clair Crude Oil Purchasing Co. Four scouts have left the Stanolind Crude Oil Purchasing Co. to go with Sinclair. They are George Johnson, stationed at Enid; George Cole, Shawnee; C. M. Seren, Ardmore and K. B. Absher, Wichita. Wood White, who also was one time chief scout of the Sinclair Crude Oil Purchasing Co., will be stationed in Oklahoma City with the new department.

* * *

A note from Holland S. Reavis, New York, says that he has given up all connections with financial houses and will address himself to the task of writing a book on the oil industry. This, we believe, will be no ordinary book filled with statistics on the growth of the industry. "Holly" has been observing this industry for a good many years from points of vantage and he can be counted upon to speak with vigor and understanding.

* * *

C. A. Markey, who has been head of the land department for the Midwest Exploration Co., Amarillo, has been transferred to Tulsa for duty with the land department of the Dixie Oil Co.

* * *

R. E. Williams, of the Shell Petroleum Corp.'s land department in Tulsa, is returning to Amarillo. He had charge of the work in that district up to about a year ago for the Shell and resumes his former position.

* * *

Casting about for something to dignify their calling, the royalty boys have hit upon the word "royaltor." Maybe it's all right, but us journaltors certainly hate to see the English language distorted in that way. The custom spreads rapidly. Already, the young man who cranks the pump at the filling station where we buy our weekly five gallons, is referring to himself as a filling stationtor.

* * *

Some day Logan L. Van Zandt, Tulsa oil man, is going to avoid that one bad round which has hitherto marked his golf tournament play and he is going to step off with a glittering title. He enters all kinds of events, big ones and local battles, and he nearly always makes a good showing. He was in line for the Trans-Mississippi title this year and worked his way along to the finals, but that jinx which has pursued him for years was still busy. A bad round for him means a 75 or 76, but in the high-pressure events that is losing golf. He was the International Petroleum Exposition tournament winner in 1929, but this year the redoubtable Jimmy Manion, of St. Louis, carried off the title. Van Zandt's friends here will keep on cheering for him and some of these days they will be rewarded.

* * *

One of the birth spots of the proration hearing before the state corporation commission was the testimony of Otto Bradford, Oklahoma City umpire. Mr. Bradford formerly was a pipeliner and still talks like one. The attorneys for the protestants failed to score off him. One of them started to quiz him after he had put into the record the prices of crude oil for several years. "Just why did you have those prices ready?" he was asked.

"I was asked for it," he replied.

"Well," insisted the lawyer, "why were you asked for it?"

"I don't know why I am asked any of these questions," Mr. Bradford retorted.

At another stage of the examination Mr. Bradford was asked whether he really believed that to permit one operator in the Oklahoma City pool to produce his wells full time would cause the neighbor producers to do the same thing. He believed it would and asserted that if he owned a well whose offset was on full production he would produce his well regardless of lack of storage or pipeline outlet. Even, he said, if the oil went down the creek.

"Don't you know the state has a law against waste and that you would become a criminal through such conduct?" asked one of the lawyers, quite sternly.

"Well," said the umpire, "I'd sure take a chance on it."

After the laughter had subsided a voice was heard suggesting that Mr. Bradford be put under peace bond at once.

* * *

Stray rumors that have come the way of this department are to the effect that the federal administration is strongly considering a radical plan having to do with the wet-dry issue. The report has gotten as far as Fifth and Main streets, Tulsa, that President Hoover has practically made up his mind to recommend to the December session of Congress that the Volstead Act be amended to provide for the legal making of 2.75 per cent alcoholic content beer.

This idea, it is said, would be hitched up to farm relief. The same rumors have it that the president has conferred, very quietly, with the folks who formerly were big brewers to find out how much cereal grains they would use if they were permitted to manufacture suds again. They obliged with some stupendous figures, indicating that crop surpluses would be about wiped out.

It is generally known that the brewers are getting ready for something. Several plants are being reconditioned, new equipment is being put in. No secret has been made of this activity, you even see it in the movies.

Whether this rumor is without foundation, as to the president's intentions, it is quite a logical move. It probably wouldn't arouse as much opposition as it would have two years ago. It is no longer a sign of depravity to be opposed to prohibition. Several industrial giants have come forward in open meeting and given testimony. Advocacy of the revision of the Volstead Act as a farm relief measure would be good politics. The rural vote of the country is predominantly dry. The rural voters are in economic straits. Would they oppose, for the sake of a principle once held sacred, but now somewhat tarnished, a move designed to help them get rid of their products? We doubt it.

The oil industry wouldn't come out quite so well. The vast quantity of kerosine, used to flavor the hootch made without due process of law, would have to find another home if a palatable substitute were obtainable.

McPherson Co., Kansas, Gets New Pool; Oklahoma City Is Extended

TULSA, Nov. 8

PRODUCTION reports of the past week indicate that the Mid-Continent area had one of the most uneventful seven day periods in some time. Oklahoma was unusually quiet with the areas of 3-8-5E and 29-9-6E presenting the most interesting completions. There was considerable activity in these small pools. Oklahoma City had several comparative failures and was extended on both ends.

Kansas, as in the previous week, led in the number of outside reports. Most of the pool completions were in Eastborough area east of the city of Wichita though the Schurr pool of Rice county had one new producer in its Siliceous lime pay. The Panhandle of Texas went through all the motions but was not able to put out a well that was at all unusual.

The activity inspired by the Wilcox sand discovery of the Amerada Petroleum Corp., in 3-8-5E, Seminole county, Okla., several weeks ago, is bearing results. Located about one mile northwest of the Carr City pool, the new area has considerably increased possibilities. The latest completion, a west offset to the discovery, is that of the Pure Oil Co., No. 1 Tiger, SW NE SW, 3-8-5E. In the Wilcox from 4142 to 4160, the well swabbed 875 barrels in 16 hours.

A much more interesting well, however, is the Gypsy Oil Co., No. 1 Tiger, SE SW NW, 3-8-5E, which is producing from the Hunton lime. This formation was logged from 3926 to 3970. Though the hole was carried to a total depth of 4080, no new pays were found and the well produced 3412 barrels initially. The oil was 39.6 at 64 degrees. There are a number of Hunton producers in the pools to the south but this is the first one in the new area.

Another active spot of the week in the Seminole area was in 29-9-6E. The Amerada-Dixie No. 1 Morris, SE SW NW, was put on gas immediately on its completion and made 2115 barrels initially. The pay was in the Wilcox from 4123 to 4153. The No. 1 Pompey of the Gypsy Oil Co., in the same section, was good for 4012 barrels on air. Both of these wells are located in the comparatively recent play one mile west of Seminole City and indicate that a new pool is in the making.

Oklahoma City

Following the shutting in of the wild Morgan Oil Co. well early in the week, the operators at the north end of the Oklahoma City pool have been able to get going again. The Morgan well is being killed so that new connections may be installed.

Recent reports indicate that there are some bad spots in the field southeast of the City, particularly in 1-11-3W. Three comparative failures were registered in the north half of this section, one each for the Indian Territory Illuminating Oil Co., Slick et al and the Empire Oil & Gas Co. The first of these was drilled to 6757, plugged back to 6350 and shot, but resulted in but 167 barrels in eight hours. The second flows by heads at about 100 barrels per hour, and the third has only a small show. Both are bottomed below 6500 feet.

The north and south ends of the pool were both extended. In the E½, NE NE SE, 35-12-3W, the Jones-Blackwell No. 1 Scruggs moved the former up one-quarter of a mile with an estimated initial of 8000 barrels. The total depth of the well, 6398 feet, points to its being very high on the ridge, and the gas volume of 120,000,000 cubic feet seems to substantiate this indication.

On the lower end of the pool, the No. 5 Sudik of the Continental Oil Co., SW NW NE, 6-10-2W, just over the line in Cleveland county, is the most southerly well by one location. It made 1230 barrels in 14 hours, producing from the Wilcox, which was topped at 6670.

One of the few dry holes that ever have been found in the Oklahoma City pool turned up on the Trosper Park lease of the Cromwell-Franklin et al, in 13-11-3.

Kansas

The most interesting well of the week in Kansas was again the Mid-Kansas Oil & Gas Co., No. 1 Garrett, SW NE, 30-19-1W. The well is two miles northwest of the Ritz pool of McPherson county, and is producing from the Viola.

There was considerable activity in the Eastborough pool in Sedgewick county where four new producers were added and one failure reported. The latter was in the northwest corner of 29-27S-2E, a well of the Magnolia Petroleum Co., and marks the southeastern edge of production. It found nothing but water in the Siliceous lime from 3392 to 3405.

Two of the producers are extensions on the north, one to the east and the other to the west. The first of these, the National Refining Co., No. 2 Murdock, SE SE SE, 18-27-2E, swabbed 2210 barrels in 20 hours. The pay was in the Chat which was logged from 2937 to 2951. Work-Covell et al got the western extension of nearly one-quarter of a mile in its No. 1 Trust, NE NE NW, 19-27-2E. The Chat was topped at 2997 and the hole filled rapidly with oil. No test has yet been made. It is beginning to look as if the pool might extend into Wichita.

Slick et al have another Siliceous lime producer in the Schurr pool of Rice county, though its completion at this time was more or less accidental. Since the pool has no outlet, four other wells have been shut down on top of the pay without drilling in. However the new well, which is slopping over, has been shut in to wait better days. Western Rice county will have on 8-inch out-

let in the very near future through the Prairie Pipe Line Co.'s new line. The seven producers of the Schurr pool are estimated as being good for 9500 barrels per day.

Texas Panhandle

Production in the Texas Panhandle took a jump of nearly 3000 barrels a day during the past week though it was not due to new production. Gray county added several dolomite producers of small size, but they were inside locations. Moore county had the most interesting well in the Shamrock Oil & Gas Co., No. 1 Coffee, south offset to its No. 1 Brumley. The latter was the discovery of production in Block 44, north of Dumas. The new well, located in the NE of 355-44-H&TC, swabbed 300 barrels from a lime pay found from 3402 to 3405, and the gravity of the oil is high.

To Discuss Equipment In Daily Use

DRUMRIGHT, Okla.—The regular monthly meeting of the Drumright field chapter, American Petroleum Institute, will be held at 7:30 p. m., Nov. 18. It will be devoted to exhibits and discussion of equipment which most of the members use every day.

A complete engine, equipped with outer bearings, representative of a standard oil field installation, will be shown. It will demonstrate the latest methods in alignment designed to prevent breaking of crankshafts and the securing of best results from the operating equipment.

In this connection lantern slides will be shown of the new method of making crankshafts and others will illustrate the several makes of four-cycle engines used for pumping.

There will also be exhibits of the latest designs of transmission systems now in use in the oil fields. One of these will illustrate the application of endless belts and another a type of drive that is new to the trade.

Texas Crude Oil Runs Curtailed Further

HOUSTON, Nov. 8.—Purchases of crude oil by Prairie Oil & Gas Co., and The Texas Co., are being further reduced in north and central Texas.

Effective Nov. 7, the Prairie announced it would reduce runs in the Nocona field, Montague county, to 860 barrels and in the general Ranger territory to 4500 barrels daily. The total is approximately half of the quantity previously purchased.

The Texas Co. cut its Ranger district runs approximately 60 per cent.

In the Panhandle, Philtex Oil Co., subsidiary of the Phillips Petroleum Co., has announced discontinuance of oil buying in Texas. Simultaneously, royalty owners were advised that from time to time attempts would be made to find a market for royalty oil in storage.

Texas total production, which ended October at approximately 780,000 barrels daily, compared with earlier daily averages around 770,000 barrels, promises to be reduced through revision of prorating allotments in various districts.

Panhandle allowables were reduced from 80,000 barrels to 70,000 barrels for the Nov. 1 to 15 prorating period; Darst Creek, in the Luling fault zone, went on a 30,000 barrels daily maximum compared with 44,000 barrels in the last official prorating period and approximately 58,000 barrels daily, late in October.

Mexico Authorizes Unit Oil Development

WASHINGTON, Nov. 10.—Mexico, by presidential decree, has authorized the adoption, by concessionaires, of the unit plan for the development of its petroleum resources. Co-operative work is authorized both as to exploration and exploitation.

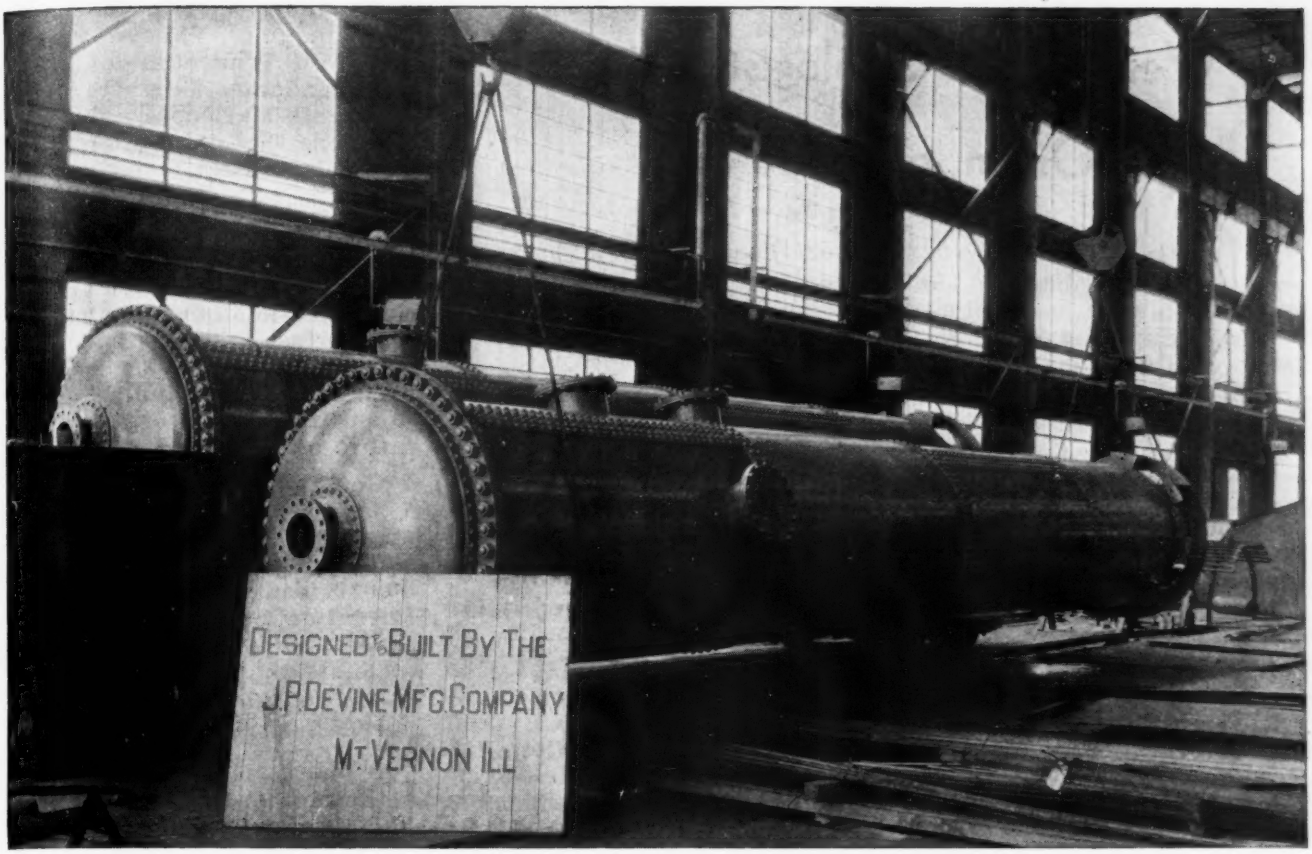
The decree by President Rubio provides that if and when two or more concessionaires ask for it the Ministry of Industry, Commerce and Labor is authorized to give permission to such concessionaires to explore and develop their holdings according to a definite technical plan instead of proceeding in the manner provided by the petroleum regulatory law. The areas to be explored and exploited must be adjoining or continuous.

However unification of two or more concessions will not reduce the amount of money to be spent or hold back production. The first article, according to the translation sent to the Department of State, says "the Ministry of Industry, Commerce and Labor is authorized, in cases where two or more petroleum concession holders solicit permission to explore and exploit, according to a defined technical plan, the lands entirely or partially covered by their concessions, if the lands included in said plan form a continuous surface area, to permit the sum of the investments required to keep up the regular works to be distributed over the entire tract during the time of exploration, as the plan in question may determine; with the understanding that at the end of said time, the unified lands will have received individually the benefits of the investment legally corresponding to them."

Investment as used in the decree is taken to mean what, under the placer mining law of this country, is known as "assessment work"; that is, the minimum amount to be spent to hold the right to mine. The rest of the decree says:

"Article 2—For compliance with the regulatory obligations with respect to the maintenance of regular works during the exploitation of the unified land, the Ministry of Industry, Commerce and Labor may likewise permit the production to be determined by the technical plan, provided that at the end of each year the unified properties shall have fulfilled their individual obligations as regards production.

"Article 3—For the effects of the annual investment required by Article 49 of the Regulations of the Petroleum Law, it shall be understood that this must be equal to the amount corresponding to each field, and that in all cases where said investment is not made annually within the area of the unified land, the concessions are individually and simultaneously cancelled."



Built for a Pratt Cracking Process Installation

The evaporators pictured, 6 feet 6 inches by 40 feet, were built for and are now installed in a Mid-Continent refinery.

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West Coast Geologists Discuss Origin of Petroleum

LOS ANGELES, Nov. 8

BITUMINOUS nodular shale overlying the basal Miocene producing sand of the Playa del Rey oil field near Venice, is a likely source of petroleum in that area. This was the conclusion of H. W. Hoots and A. L. Blount, Union Oil Co. engineers, in a paper before the seventh annual meeting of the Pacific Coast Section American Association of Petroleum Geologists in Los Angeles, Nov. 6 and 7.

In the election of officers for the coming year, Dr. M. G. Edwards, Shell Oil Co., and Louis N. Waterfall, Union Oil Co., were elected president and secretary-treasurer, respectively. Retiring president Dr. Ralph D. Reed, The Texas Co., presided at the meeting and read a paper on Petrography of Oil Shale that was a review of Potonie's book on the subject.

Origin of oil was a favorite subject among the 15 papers. E. K. Soper reviewed Krejci-Graf's book on the origin of Roumanian oil. This review and that by Dr. Reed were on books on which no English translation has been published.

"Effects of Underground Storage Conditions on the Characteristics of Petroleum" was the title of a paper prepared by Paul W. Prutzman.

Mr. Prutzman offered a theory that presupposes the production of petroleum by destruction of organic matter—either vegetable or animal—with the probability that it is produced in minute quantities at any one time and place and not in accumulated masses. Such destructive distillation goes on at relatively low temperatures—250 to 300 F.—at which temperatures it is likely a maximum amount of hydrocarbons of low boiling points would be produced, he said.

In all probability petroleums, when first formed, are comparatively uniform in nature, being made up of entire series of hydrocarbons from lightest to heaviest—the preponderance of either end fractions controlled by hydrogen-carbon ratio of the raw material.

Mr. Prutzman pointed out that petroleum already formed may be subjected to temperature and pressure changes sufficient to dissociate the crude and make additional changes in its characteristics, and that certainly temperature changes of less magnitude may modify the oil by fractional distillation.

He indicated the manner in which migration of crude through a porous strata might modify it by retarding the heavy ends and increasing the proportion of lighter and more volatile hydrocarbons. He also dealt with the effect contact with sulfur might have in increasing the proportion of bituminous constituents, and also added that a combination of the two forms of modification might further increase the proportion of light ends.

Thomas L. Bailey read a paper on the Miocene Stratigraphy and Source Sediments for Vaqueros Oil in the Santa Barbara District. Pointing out that this section of the coastal plane is divided into the Santa Margarita, the Monterey, the Vaqueros mudstone, and the Vaqueros sandstone, Mr. Bailey described the lithology and presented evidence for determining the age and correlation of each.

Conclusions were that the possible generative sediments for oil now stored in the Vaqueros sandstone are Monterey shale, Vaqueros mudstone and Eocene shales. The Monterey is by far the richest source rock and probably contributed most of the oil in this area. Discussion was also offered concerning the various means by which the oil may have migrated from the overlying shales into the productive Vaqueros.

Of particular interest, during the present exploitation work under way in the lower San Joaquin Valley, was a paper on Truncation of Maricopa Sandstone Members at the Etchegoin-Maricopa Contact, Maricopa Flat district, prepared by E. R. Atwill.

The paper discussed the subsurface geology of a portion of the Maricopa Flat field, and described the manner of truncation of sandstone members at the contact. Suggestions were offered as to the reasons for commercial accumulation at this point and also as a guide to future drilling.

George A. Maccready, offered a paper on the Geological Column of Western Washington in which he says there is probably 30,000 feet or more of Tertiary formation west of the Cascades. Shale predominates with lesser amounts of sandstone and igneous rocks, and Miocene, Oligocene and Eocene were found.

A paper dealing with the hypothesis that the higher homologues might be decomposed by methane bacteria into carbon dioxide and the corresponding hydrocarbons, was given by Lewis A. Thayer. The title was: The Bacterial Genesis of Hydrocarbons from Fatty Acids.

Taft A. P. I. Chapter Is Organized

LOS ANGELES—More than 100 field men attended the organization meeting of the Taft chapter of the American Petroleum Institute the evening of Oct. 22. R. R. Shinn, production superintendent for General Petroleum Corp., was elected chairman; C. L. Moore, of the Chanslor-Canfield-Midway Oil Co., vice-chairman and M. W. Morris, Standard Oil Co. of California, secretary-treasurer.

A short talk was made by W. F. Barbat, Standard Oil Co. geologist, on the relationship of paleontology to oil field development. The next meeting will be held Dec. 4.

Plans are being made, says A. H. Bell, Pacific Coast chairman, for the organization of a chapter in the Ventura district.

New Completions in Playa del Rey Boost Output to 35,000 Bbls.

By Jack N. Westsmith

N. P. N. STAFF WRITER

LOS ANGELES, Nov. 7

CALIFORNIA production news was monotonous the past week except for two tests in the San Joaquin Valley that indicated a discovery of some kind or another, and a third in the Los Angeles Basin that offered encouragement to operators looking for deep production in the Huntington Beach field.

Playa del Rey came through for another spurt of flush oil to boost the daily production to nearly 35,000 barrels. Additional numerous completions scheduled for the next fortnight offer complications to an orderly proration program.

Of 28 notices to drill, filed with the California state, division of oil and gas, 16 were for wells in the del Rey pool, four in Long Beach, five in the San Joaquin Valley and three in the coastal fields.

In the California proration schedule for November, Playa del Rey is given a potential output of 34,575 barrels, and an actual daily yield of only 800 barrels less. Despite consistent efforts by conservation leaders to bring this outlaw field into the group of those co-operating in the proration movement, the field is still attempting to operate as a separate and distinct unit.

Nature, in the form of encroaching edge waters in the lower zone, is expected to aid conservation by eliminating those out-and-out promoters who have overdrilled certain sections of the townlot area.

Continued steady production from wells in the upper zone at del Rey coupled with nearly a dozen new completions kept the production curve on the upgrade. The La Bara Oil Co. obtained the only completion in excess of 1000 barrels daily. The others averaged between 300 and 400 barrels per day each.

Just about the time Richfield Oil Co.'s No. 1 in the North Belridge area began to look like a duster it is reported to have picked up the Temblor formation. Field scouts believe preparations are under way to run about 5700 feet of casing. This would place the productive level more than 300 feet below that in Belridge Oil Co.'s No. 15, deep sand discovery well for the area, which was bottomed at 5475 feet and which continues to produce about 2900 barrels of 35 gravity oil and 60 million cubic feet of gas.

RATHER vague reports indicated promising showing in a wildcat test on the floor of the San Joaquin Valley, south and east of Bakersfield. The project, being drilled by Dr. J. J. Richie, an independent operator, on Sec. 33, 4-19 is said to have cored over 100 feet of oil sand below 4725 feet, where the formation was first penetrated.

Analysis of oil, reported to have accompanied a gas blowout several days ago, indicates a paraffin base oil of 25 to 30 gravity. No authentic reports were available as the week closed and several geologists discounted the field rumors.

This purely wildcat test is approximately 8 miles east of Wheeler Ridge oil field bordering the southern edge of the San Joaquin Valley and is about 20 miles south and east of the Maricopa Flat field. It is on the Tejon Ranch property of which Dr. Richie is reported to have nearly 2000 acres under lease.

In the Kettleman Hills, Superior Oil Co. started to drill its Huffman No. 2 on Sec. 29, 21-17 and Richfield Oil Co. spudded in its initial test of holdings on Sec. 36, 21-17. These units are on fee land and will be pushed to completion although the 7000 odd feet of very tough drilling will postpone the date of this event for six or seven months.

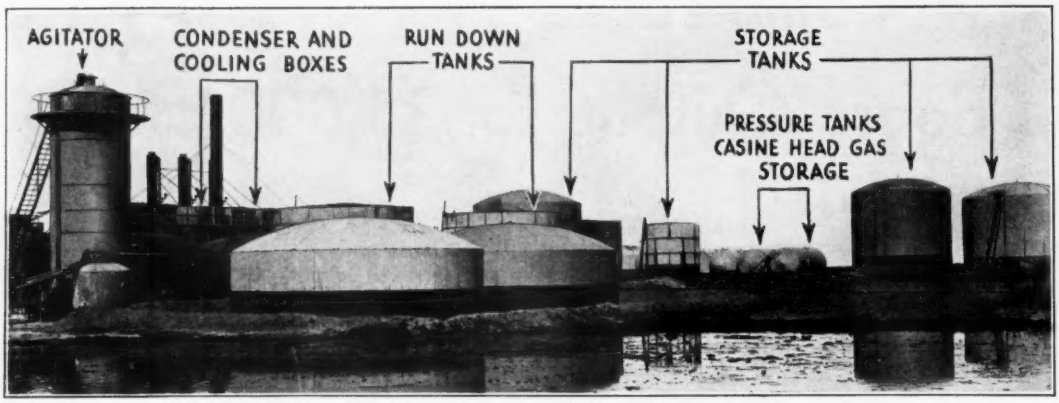
California operators did their best the past week to bring the record for the world's deepest producer to the Pacific Coast. Star Petroleum Co. completed its Colby No. 2 in the Los Cerritos district of the Long Beach pool at 8600 feet. Even at this depth the formation was reported as nearly 250 feet thick, giving a daily yield of 500 barrels of clean, 30 gravity oil.

The Colby No. 2 is a shallow producer deepened to tap a pay developed by Italo Petroleum Co. several months ago. Italo found its production at about 7500 feet. Scouts look for an increase in activity as additional projects are deepened to tap the lower horizon.

OVER a year ago Shell Oil Co. drilled its No. 11 well on the Nesa lease to about 9250 feet without developing commercial production. This test was on the south flank of Signal Hill and was considered conclusive for that section of the Long Beach field.

From an engineering viewpoint it is interesting to note that the Colby No. 2 effected a water shut off with 4¾-inch casing at 8470 feet.

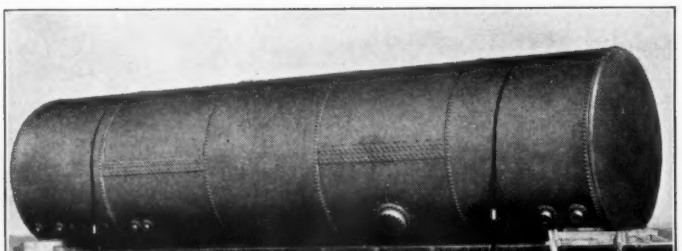
Another interesting test in the Los Angeles Basin was being conducted by an independent operator in the Huntington Beach play. The project is below 6600 feet and reported to have a strong gas pressure together with a showing of oil in the ditch.



Refinery equipment by Graver. Arrows indicate fabrication from Graver shops

GRAVER

STEEL PLATE CONSTRUCTION



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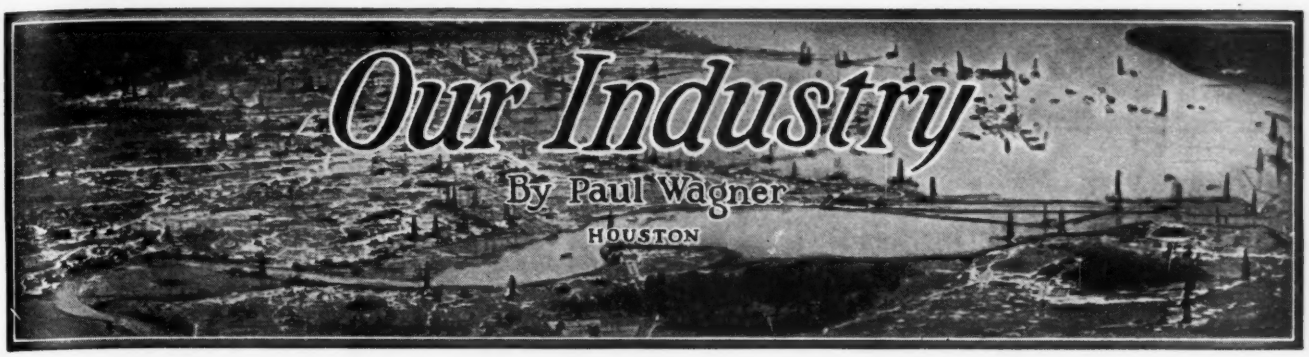

AMONG the important shifts in the refinery department of The Texas Co. is the transfer of W. K. Holmes, formerly superintendent of the Port Arthur works to Los Angeles, where he became vice president of The Texas Co. of California. He succeeded L. R. Holmes, transferred several months ago to New York headquarters of The Texas Corp., as refinery manager. Mike Halpern, previously second assistant superintendent at Port Arthur, has been transferred to New York as assistant refining department manager.

George T. Stevens, formerly of Port Arthur, is the new superintendent at The Texas Co.'s Amarillo works, succeeding J. S. Worden, new superintendent at the Houston ship channel plant. W. C. Adams of the New York refining department was transferred to Houston as Mr. Worden's assistant.

J. R. Reed, formerly assistant superintendent at The Texas Co.'s Lockport, Illinois works, succeeded P. T. Williams as superintendent at Pryse. Mr. Williams was transferred to the Wilmington works, in the Los Angeles basin, as assistant superintendent.

* * *

James Anderson, crude oil vice president of Humble Oil & Refining Co., Houston, and alter B. Pyron, resident vice president at Los Angeles of the Western Gulf Oil Co., spent their vacations in Honolulu.

* * *

F. B. Ballantine, formerly in the Ponca City land department of Continental Oil Co., has succeeded Stacy B. Dorn as Texas-New Mexico division head of the land department at Fort Worth. C. Dorn recently resigned to engage in business for himself.

Levi Smith, president of Big Lake Oil Co., operating subsidiary of Plymouth Oil Co., with headquarters at Texon, Texas, has been spending his vacation at Hot Springs, Arkansas.

* * *

William E. Wrather, consulting geologist and active in American Petroleum Institute research, has been named president of the executive committee of the Dallas Art Institute. Mr. Wrather recently returned from a summer in Europe, where he went on a business mission; afterwards making a study of structural conditions in the Alps with Dr. W. A. J. M. van Waterschoot van der Gracht, formerly research vice president of Marland Oil Co. of Delaware, who is now living in Austria. Mr. Wrather is a former president of the American Association of Petroleum Geologists.

* * *

Frank Kendricks, chief geologist, and P. G. Russell, Ranger district geologist, of the Lone Star Gas Co., Dallas, mapped the area four miles north of Cisco, Eastland county, where the Lone Star is conducting extensive gas development. Potential production of the area from completed wells is estimated at 300,000,000 cubic feet daily. Other tests are being drilled.

* * *

Frank Park, superintendent of the New England Fuel Oil Co., at Panuco, spent his vacation at Hot Springs, Arkansas.

* * *

Oil and gas properties in Louisiana, Arkansas and Texas, belonging to the Moran Corp. of the South, are operated by William T. Moran and John W. Anderson, his executive assistant. These properties were retained when the subsidiary Moran Gas Corp., operating in the Corpus Christi district, was sold earlier this year to the Moody - Seagraves interests, which in turn transferred its properties to the United Gas System as a part of their deal with the parent Electric Bond & Share Corp., several months ago.

* * *

John H. Bell, assistant auditor of the Mexican Gulf Oil Co., at Tampico, has been spending a vacation in San Antonio and Houston. He was accompanied by his family.

* * *

Vernon shops formerly operated by General Petroleum Corp. of California, subsidiary of Standard Oil Co. of New York, have been leased by the Vernon Tool Co., Ltd., composed of Harry Isaacs and George Fentress. Mr. Isaacs is president and Mr. Fentress general superintendent. Both were long associated with the General before forming the present corporation.

* * *

James O'Brien, manager of the Transcontinental Oil Co., subsdiary of Standard Oil Co. of New Jersey, at Tampico, has returned from a visit to the United States, including a trip to the Tulsa exposition.

* * *

H. A. Burgon is now secretary-treasurer of the Andian National Corp., Ltd., Toronto, affiliated with International Petroleum Co., both subsidiaries in Colombia, South America, of Imperial Oil, Ltd., and stock-controlled by Standard Oil Co. of New Jersey. He succeeded A. H. Weisgerber, who joined the Ajax Pipe Line Co., with Tulsa headquarters.

JACKSON

EXPERIENCE

JACKSON ABSORPTION PLANT OR FRACTIONATING UNIT INSTALLATIONS for large Oil and Gas Companies have *recently* been made in Refineries and Oil Fields at the following locations:

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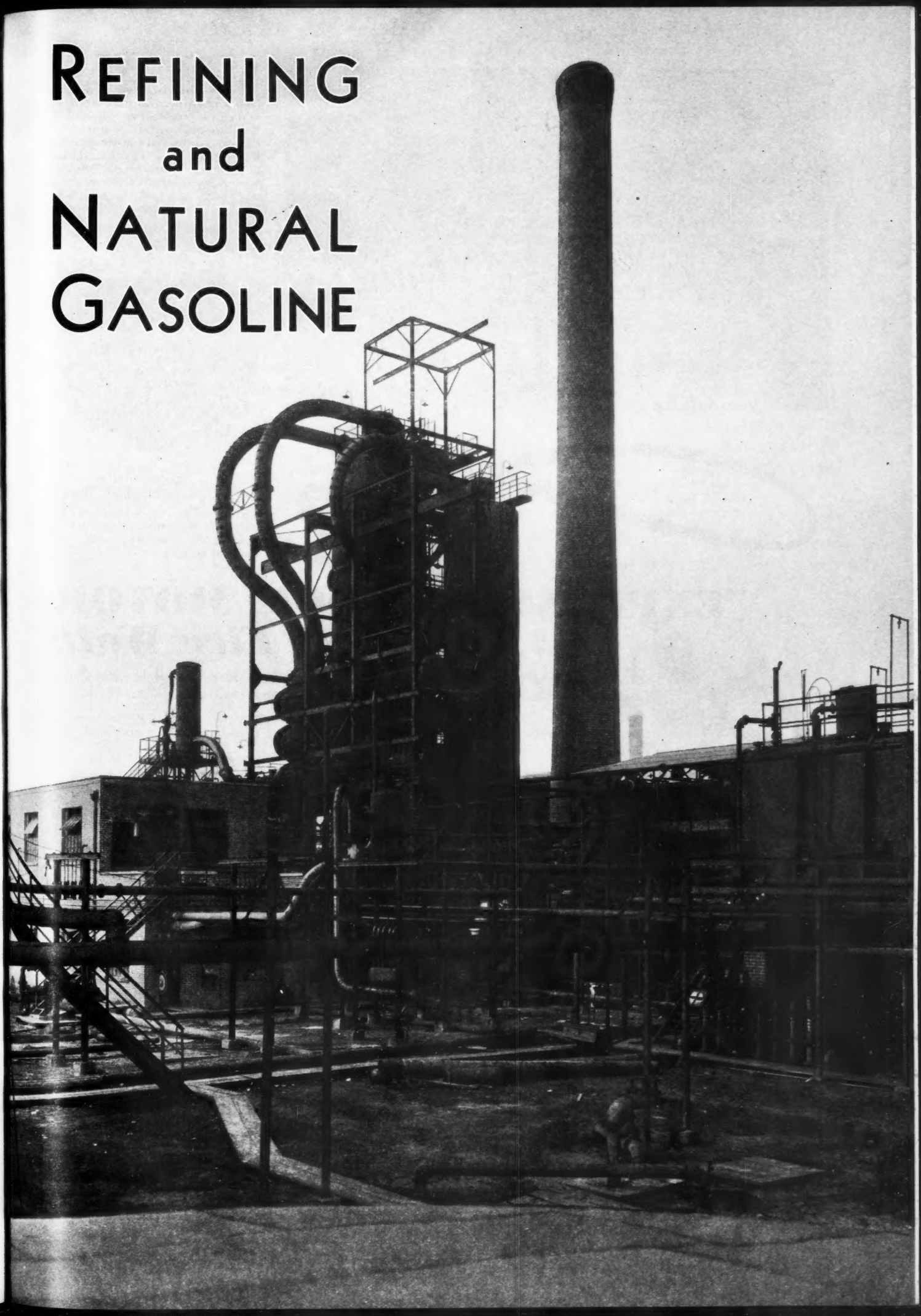
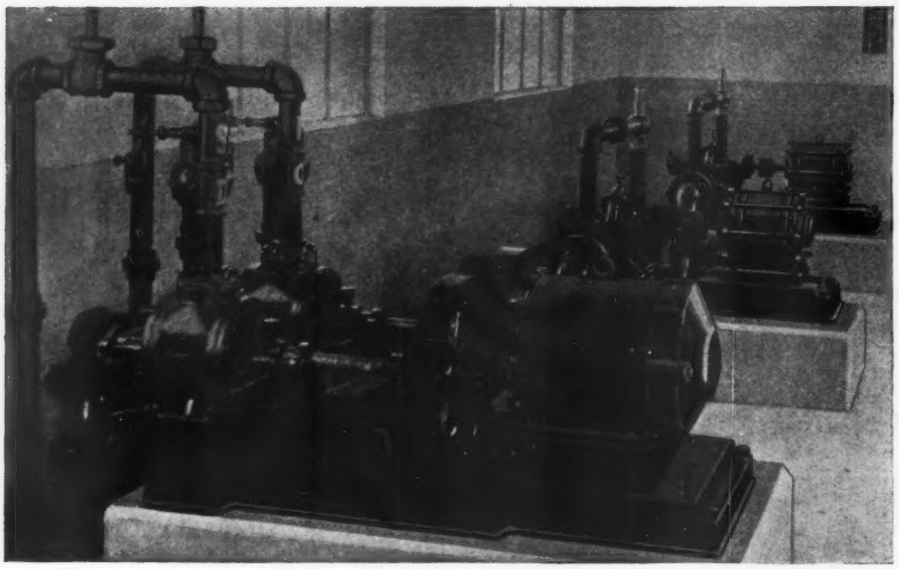
Brave, West Virginia
Heath, Ohio
Wood River, Illinois
Arkansas City, Kansas
Salt Creek, Wyoming
Elwood, California
Muskogee, Oklahoma
Port Arthur, Texas
Sweetwater, Texas
Pampa, Texas
Channing, Texas
Oklahoma City, Oklahoma
Seminole, Oklahoma
Cromwell, Oklahoma
McCamey, Texas
Gordon, Texas
Baton Rouge, Louisiana
Shiprock, New Mexico

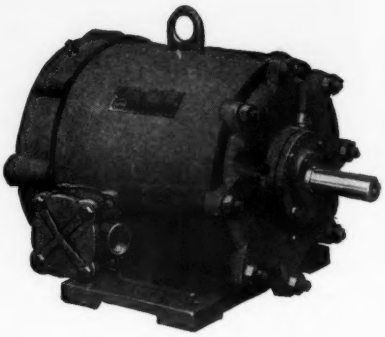
NEW YORK DALLAS TULSA LOS ANGELES

REFINING and NATURAL GASOLINE





VIEW showing part of new loading-rack pump-house, at a large Oklahoma refinery, where 5 L.A. "explosion-proof" motors are direct-connected to pumps of well-known make. The *small size* of L.A. "explosion-proof" motors—which generally fit into same space as "open motors"—*permitted the use of stock pumps with standard bases.*



Louis Allis
"Explosion-Proof" Motor.
Approved by Underwriters' Laboratories for operation wherever petroleum products are made, used or handled.

"EXPLOSION-PROOF" MOTORS ...*Eliminate Fire Walls!*

HERE is a *1930* loading-rack pump-house, where large interstate tank trucks and trailers are loaded, at one of Oklahoma's largest refineries.

The pumps (including two not shown in the picture) handle *stove distillate, fuel oil, kerosene,* and *3 grades of gasoline.* Consequently, *explosive vapors* may prevail throughout the pump-house.

Yet there is no need here for the conventional fire wall between pumps and motors. Fire walls, although included in the original plans, were *eliminated* when the Refinery Engineer specified Louis Allis "Explosion-Proof" or type E motors for *all* pumps in this building.

And this decision *not only* avoided expensive, inflexible, and antiquated construction. It also eliminated the *dangers of fire walls* due to possibility of defective stuffing boxes, openings left around shaft, and doors in fire walls being left open.

WARNING to REFINERS!
Do not confuse the Louis Allis "EXPLOSION-PROOF motor with so-called "vapor-proof" motors. Real "EXPLOSION-PROOF" motors must be specially constructed and must pass severe explosion tests to be approved by Underwriters' Laboratories for use in explosive atmospheres.

With type E motors, you are not *guessing* at safety. Your *assurance* is the fact that these motors are tested and definitely approved by Underwriters for use in *explosive atmospheres* of petroleum vapors. Then why install fire walls—or, worse still, non-approved motors? *Standardize* on Louis Allis "explosion-proof" motors wherever explosive atmospheres may prevail!

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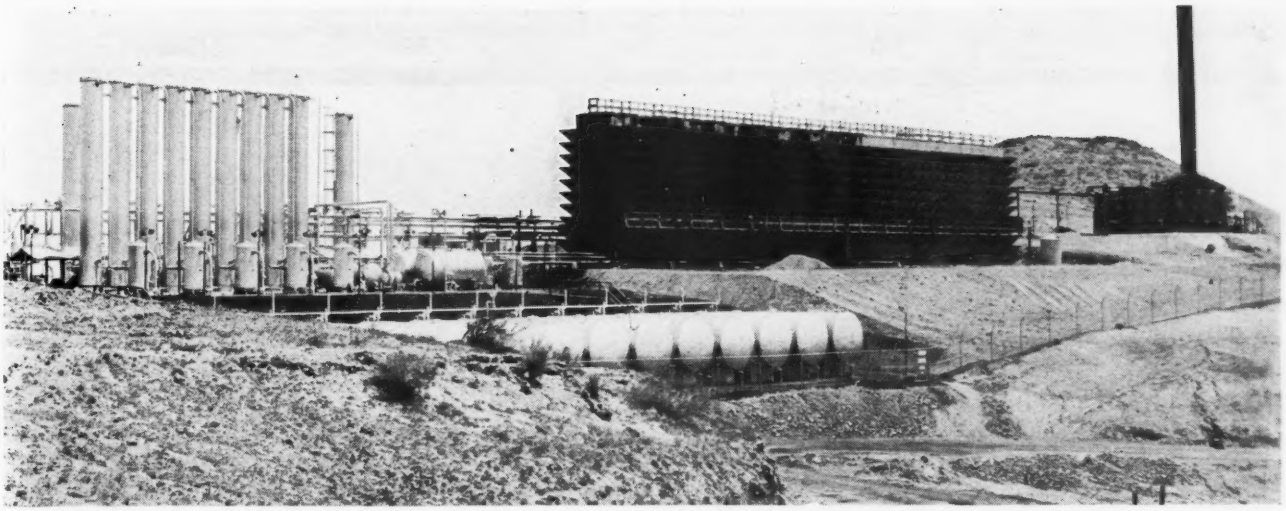


Fig. 1—Gasoline plant at Los Nietos, Calif.; note systematic compactness of installation

Largest Gasoline Plant Handles 100 Million Feet Per Day

By George Thompson*

THE Los Nietos gasoline absorption plant at Kettleman Hills, Calif., has a rated capacity of 100,000,000 cubic feet of gas per day at 450 pound gauge pressure and a finished gasoline capacity of 75,000 gallons per day.

This is the largest plant ever purchased in a single order. It consists of two units; the first unit was completed and ready for operation within 39 days from the day of signing the contract with the Foster Wheeler Corp. for the design and construction of the plant. The second unit was completed 26 days later. The flow sheet is shown in Fig. 2.

All the high pressure gas, which is 92,000,000 cubic feet per day at the present time, comes from two wells. Usually one well in Kettleman Hills will fill a plant of this size to capacity.

In addition to the high pressure gas which the plant treats, there are the low pressure trap vapors and uncondensed vapors from the condensers which are collected with compressors and passed through a low pressure absorber.

The low pressure absorber is not shown on the plan or flow sheet, Fig. 2. There are usually three sets of traps for a well in Kettleman Hills. The first one separates the gas from the oil at about 500 pounds pressure. This gas goes directly to the plant without compression. A typical analysis of the gas and gasoline is given in Table 1.

The second set of traps usually operate at about 40 pounds, and the third set operate at about atmospheric pressure.

The low pressure gas will sometimes contain as much as 10 gallons per 1,000 cubic feet of gas. The finished gasoline from this plant is 96 per cent Engler recovery gasoline. Two of the plants in this field are making a gasoline of approximately 98 per cent recovery.

As level ground is scarce in Kettleman Hills, the plants in general must be compact, but still accessible. It was necessary to move 4,000 yards of earth to build this plant, a photograph of which is shown in Fig. 1.

The equipment was laid out in straight lines for reasons of accessibility and ease of operation, as well as to best utilize the hog back available.

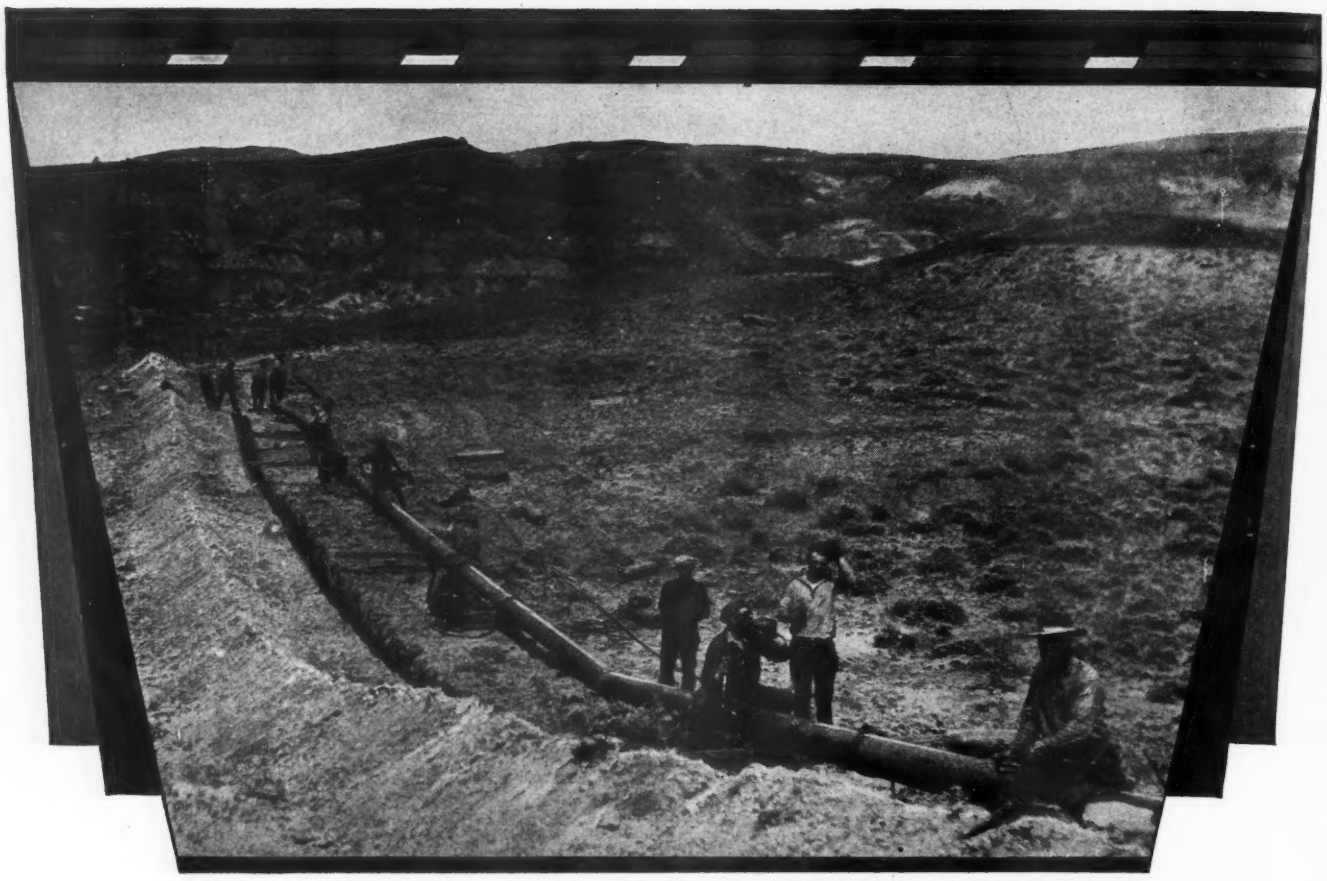
The plant has centralized gage boards where all of the pressure gages of each unit is located, as well as the recording thermometer showing the temperature of the fat oil to the still and the one recording the temperature of the vapors from the top of the fractionator to the condenser.

The operator can stand at the gage board and see every piece of equipment connected with the unit. This feature is particularly convenient in starting a set of pumps. A shift from one pumping unit to another can be made in a couple of minutes, as the turbines are always kept warm.

Pumps

The main pumping units are turbine driven centrifugal. One turbine drives three pumps as

*Supt. Los Nietos gasoline plant, California.



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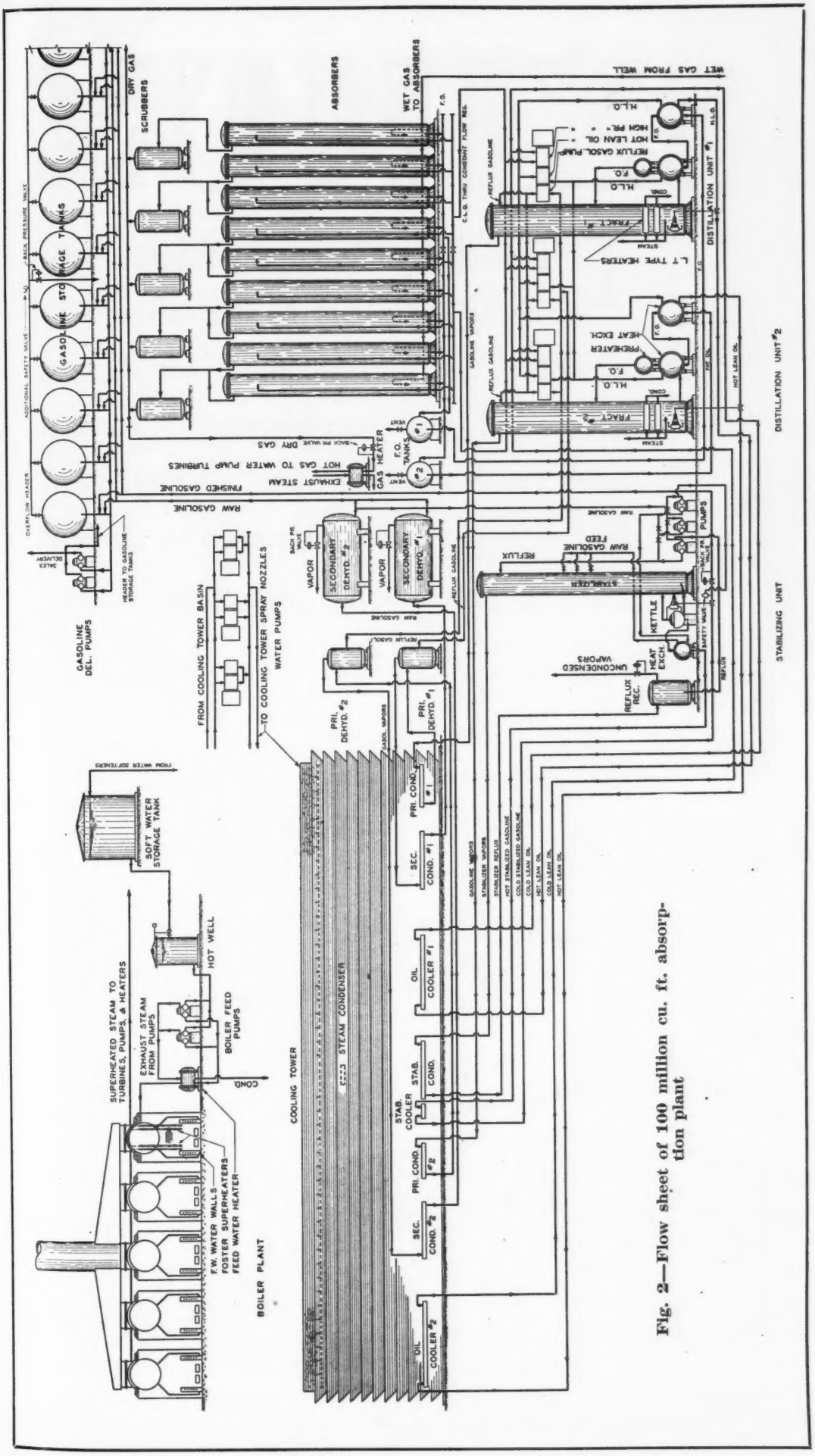


Fig. 2—Flow sheet of 100 million cu. ft. absorption plant

above stated. One is a cold high pressure lean oil pump which takes suction from an atmospheric balancing tank, and the other is a hot lean oil pump which takes the lean oil from the gravity heat exchanger and pumps it through the pressure heater exchanger and oil coolers to the balancing tank.

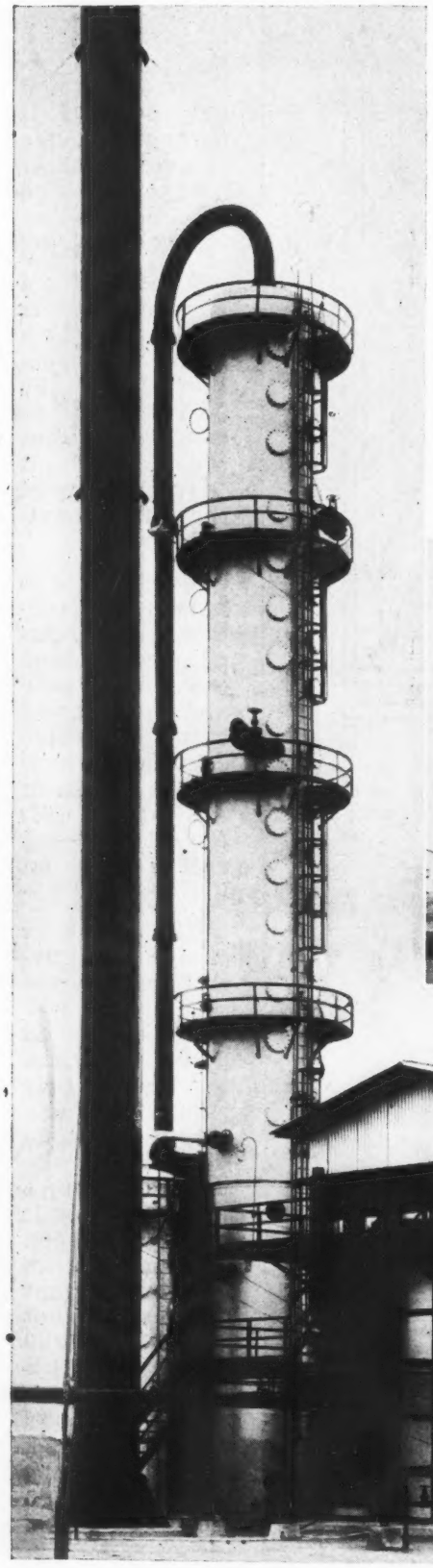
The other is a gasoline reflux pump which takes the gasoline from the primary condenser dehydrator and pumps it over the top of the fractionating tower.

All three pumps and turbine are mounted on a common cast iron base and connected through flexible couplings. These pumps run at 3450 R. P. M. An oil pumping unit is shown on Fig. 3.

The water pumps are driven by a separate turbine. It was more economical to do this than to drive four pumps by one turbine due to the fact that the water pumps were so large it would have been necessary to run all four pumps at a speed not over 2200 R. P. M. This would have made the oil pumps much larger than they are at present.

The turbines

①MAXIMUM



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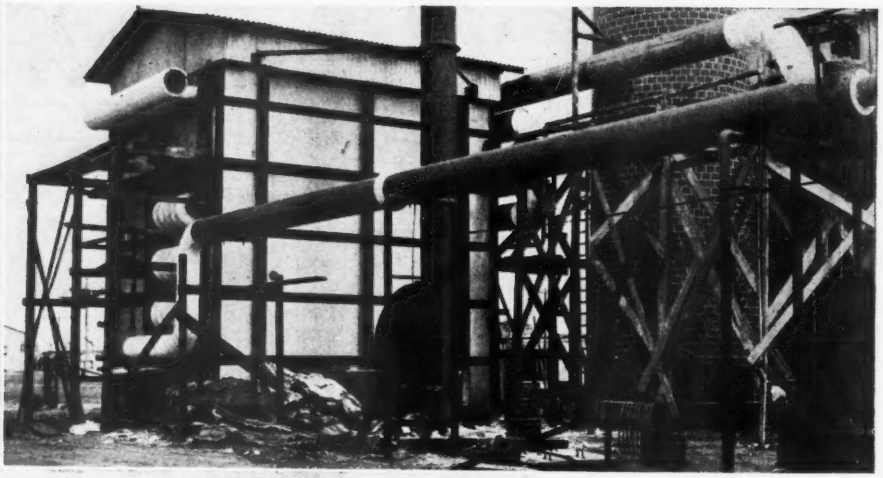

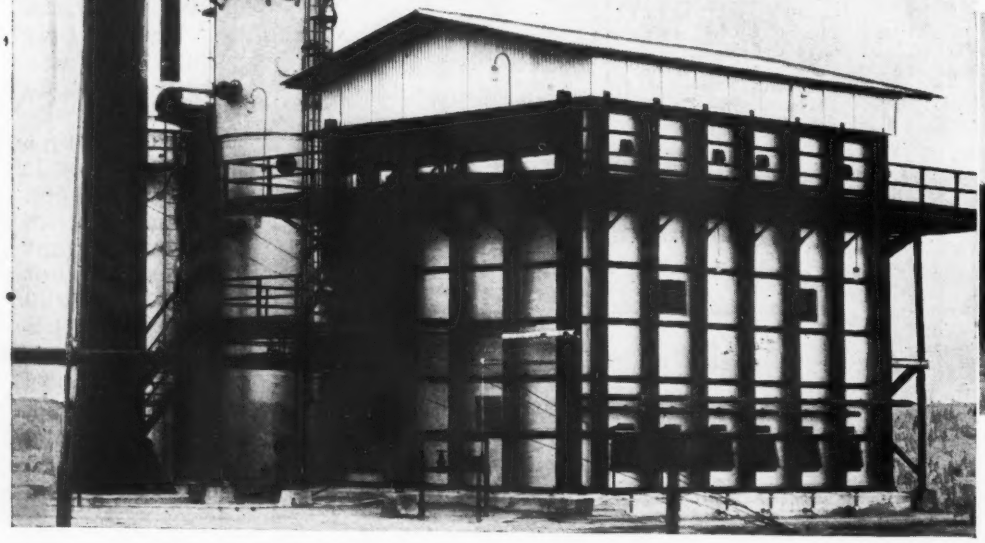

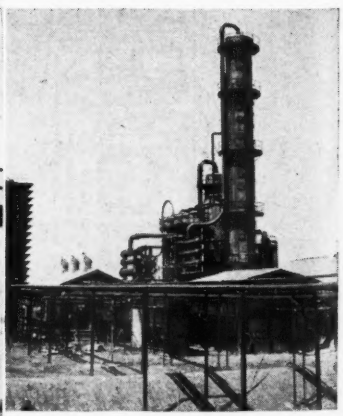

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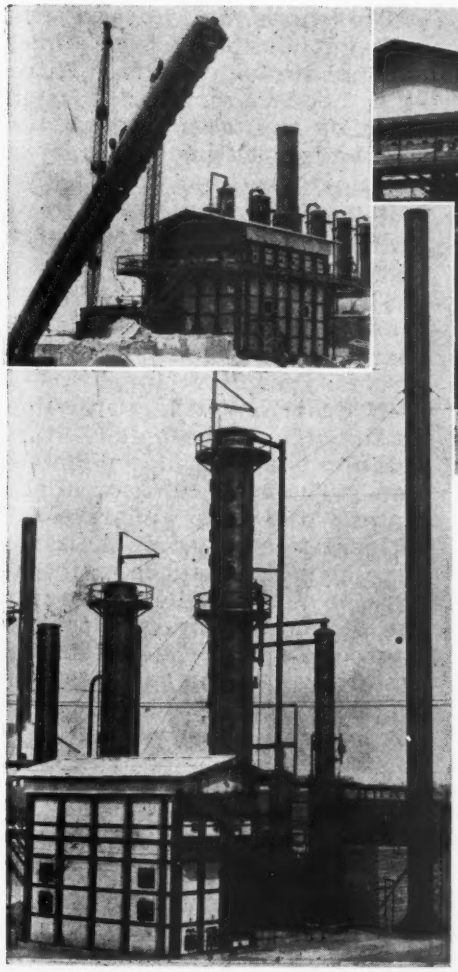

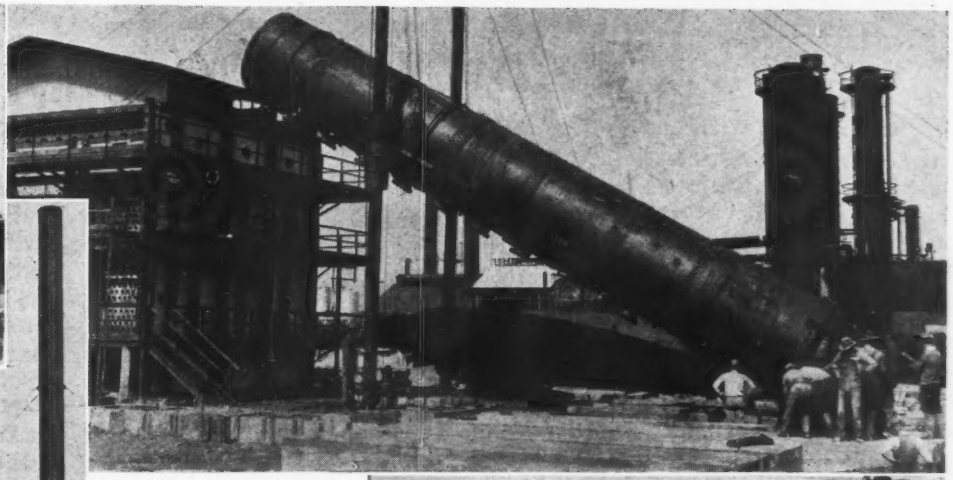

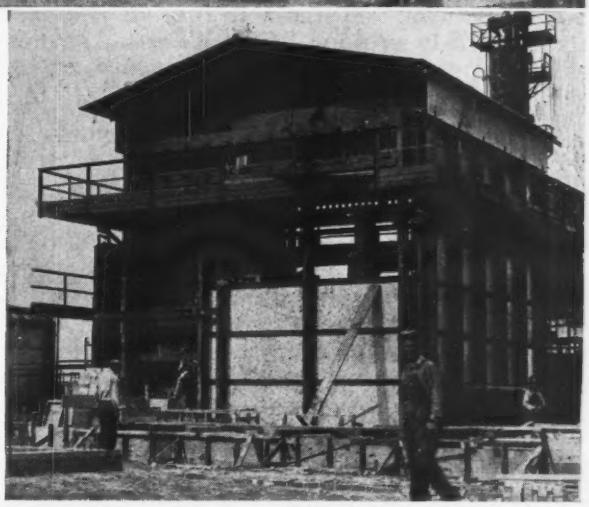

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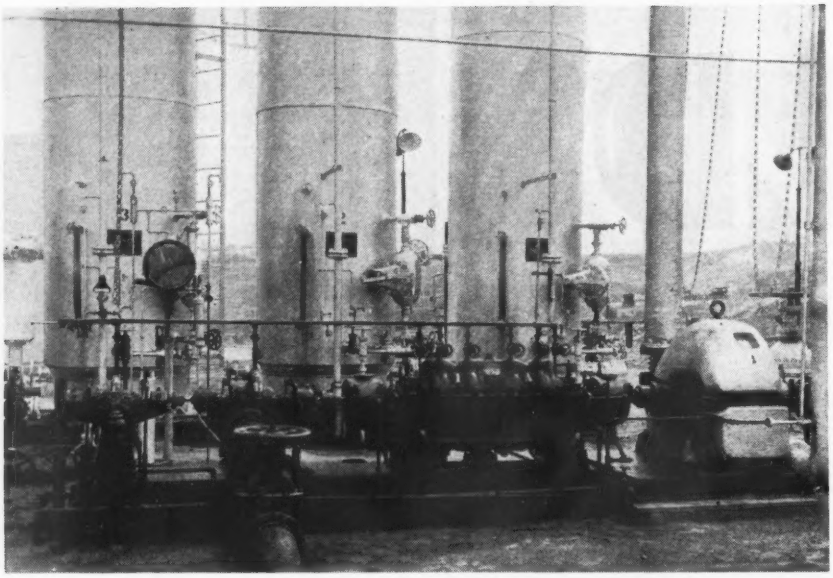


Fig. 3—Cold lean oil, hot lean oil, and gasoline reflux pumps, mounted on one base and driven by one motor through flexible couplings

are driven by 180-pound dry gas at 250 degrees Fahr. The gas is heated before going to the turbines by exhaust steam in a gas heater. The turbine driving one oil pump takes steam at 145 pounds and 510 degrees Fahr. The exhaust is at 40 pounds, and 330 degrees Fahr., and is used for reduction purposes in the still. By thus balancing the steam employed in the plant, waste of steam to the air is entirely avoided. The one pump supplies just enough exhaust steam for the two stills.

The other oil pump operates on dry gas the same as the water pumps, although preheating is not essential. One oil pump turbine is temporarily operating on gas with an initial temperature of 110 degrees and the discharge temperature is from 35 degrees to 40 degrees Fahr., which is high enough that there is no danger of freezing of moisture particles which might be in the gas.

All the reciprocating pumps in the plant such as transfer pumps, gasoline shipping pumps and rectifier pumps, are driven on hot dry gas. The exhaust from the gas pumps is discharged to a stack and is wasted. This is possible on account of the fact there is no sale for the majority of the dry gas.

Table 2 gives the gas required per H.P. to drive the turbines. Standard steam turbines are used without the addition of extra nozzles or reversing chambers. The pressures given on this table are ahead of the governor. The turbines were not equipped with connections to obtain the pressure in the steam chest.

Table No. 1

Fundamental Analyses of Gas and Gasoline

Sample	Per Cent by Volume 1	2	3	4	5	6
Oxygen	0.40		0.65	0.42		
Carbon Dioxide	0.20		0.70	0.42		
Methane	79.94	83.04	24.78	85.00	2.34	
Ethane	9.63	9.01	16.23	8.03	21.43	
Propane	4.94	4.61	23.91	4.22	75.62	2.02
Iso-butane	0.92	0.75	6.51	0.76	0.61	3.05
Nor-butane	1.90	1.47	15.27	0.99	0.10	14.33
Iso-pentane			5.55		0	15.61
Nor-pentane			4.48		0	17.71
Pentane plus	2.07	1.2		0.16*		
Hexane plus			1.92			47.28

Sample 1 is high pressure wet gas from Wheepley No. 1 well
Sample 2 is high pressure wet gas from Felix No. 1 well
Sample 3 is low pressure wet gas from Wheepley No. 1 well
Sample 4 is high pressure dry gas from absorption plant
Sample 5 is rectifier overhead vapors
Sample 6 is finished gasoline from plant. 96% recovery

*Due to hot wet gas entering tower causing F.O. to leave at 130°F. When F.O. temp. leaving absorbers is not over 118°F. there is no pentane in dry gas.

Steam Generating Unit

The steam generating unit of this plant is different from the average boiler installation in a gasoline plant. Modern steam plant practices have been adopted to gasoline plants in this instance.

There are five 150 H. P. H. R. T. boilers equipped with water walls and superheater. These boilers are all served by a single stack 60 inches in diameter, and the top is 120 feet from the furnace floor. Four of these boilers will carry the entire plant load when the plant is operating with all units driven by steam.

The water walls are of the inclined horizontal type which parallel the side walls. There is a header for these water tubes on the front and rear of the boiler setting. Water is taken from the front of the boiler to the front water wall header through the downcomer pipe.

The water circulates through the water wall tubes and discharges through the rear header and upcomer piping to a point just above the water line on the side of the boiler. Circulation is by thermosyphon action. The main function of the water walls is to generate additional steam, and at the same time keep the furnace temperature low. Superheaters raise the steam temperature to 525 degrees Fahr. at the outlet. The water level in the boiler is controlled by float kidneys operating balance lever valves.

Towers

The absorbers, stills, and rectifying towers all have flanged heads of special tongue and groove construction which is absolutely tight under extremely high pressure. The towers also have removable trays and all piping to and from the towers is on the side and not on the heads. This is shown in Fig. 4.

The fat oil is discharged from the base of each absorber by means of a balance lever valve into a common line which feeds into the fat oil tank.

A back pressue valve on the fat oil tank maintains a pressure of 140 pounds. A considerable amount of dry gas is

vented from the oil at this point, the pentane content of the gas being so low as to render further treatment unprofitable. The pressure is sufficient to put the fat oil through the pressure and gravity heat exchangers and preheater into the still without pumping.

A gas oil separator or devaporizer tank is installed between the pressure and gravity heat exchangers. The function of this is to separate as much as possible of the light fractions from the oil and improve the condensation in the condensers, as well as remove a considerable amount of uncondensable gas from the still. The vapor from the devaporizer goes into the discharge from the compressors, through the gas coolers to the low pressure absorber.

The stills are equipped with internal heaters which are desuperheaters for the preheater steam. All the preheater steam is first put through the internal heaters on the two lower trays of the still where the superheat is removed before the steam enters the preheaters. The base of the still showing the internal heaters on the two lower trays is shown by Fig. 5.

Low Pressure Absorber

The low pressure absorber which is being installed to treat the low pressure gas is equipped with three internal coolers. They are of the finned type tubes and can be cleaned on the inside of the tubes without breaking any of the water piping or shutting down the absorber.

The water shut-off valves are closed to and from the coolers and the cover plates removed to turbine the straight tubes. Two additional throats were installed on the shell of the absorber for additional coolers if they are needed at a later time. They are very similar to the ones in the still shown in Fig. 5.

Absorption

One important feature of high pressure absorption is the high saturations obtained and the excessive temperatures in the absorbers. Fig. 6 shows the temperatures through the absorbers for various oil gas ratios and also a curve for low pressure absorption. The drop in the temperature of oil at the bottom of the high pressure tower is due to the entering gas being colder than the oil near the bottom of the absorber. (See Table 3.)

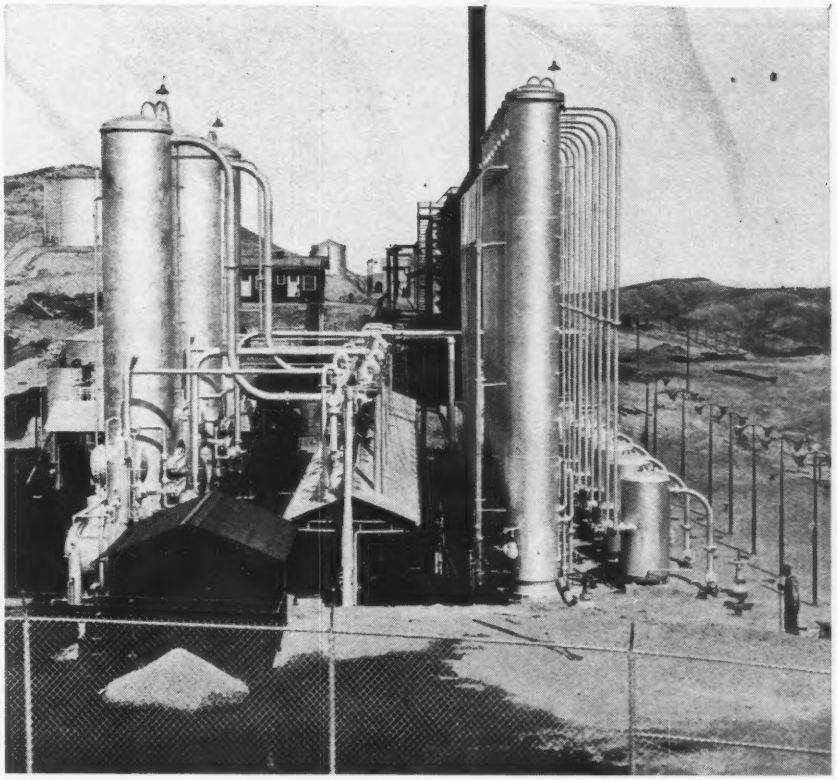


Fig. 4—End view of Los Nietos plant

In plants operating at 450 pounds pressure approximately equal quantities of oil and gas pass through the tower. Gas cooling is an extremely important feature in this case, the temperature of the oil rising rapidly in the tower.

The lean oil entering is absolutely free of gasoline. The end point of the finished gasoline in the plant is 290 degrees and the initial boiling point of the absorption oil in the system is 388 degrees. The natural end point of the casinghead gasoline from the gas when recovered with charcoal is about 260 to 270 degrees Fahr.

Exchangers

Another important feature of this installation is the high heat transfer obtained in the exchangers and preheaters together with the remarkably low temperature differential between the steam and fat oil from the preheaters and also between the lean oil from the pressure heat exchanger and the fat oil to it. This is shown on Table 3.

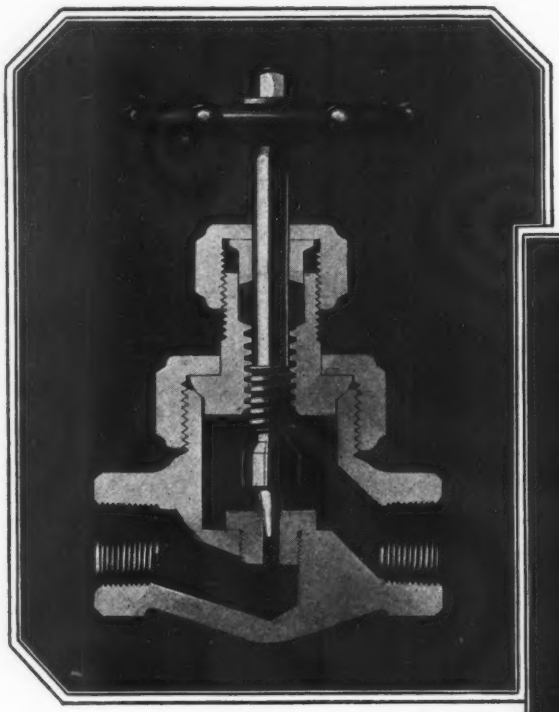
Table No. 2

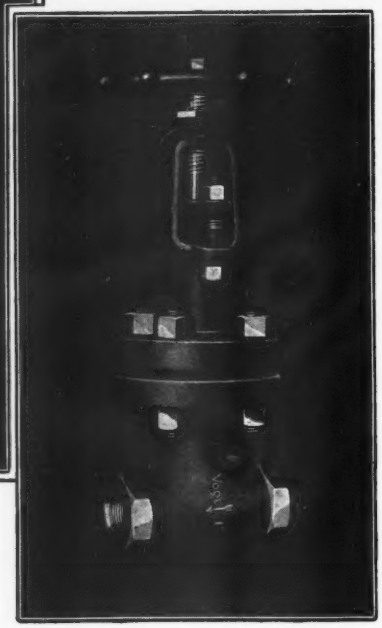
Water Pump Tests, Unit No. 2, April 27, 1930

Pumping unit consists of 1 Turbine driving 2 pumps, pumping in parallel rated as follows:
1 Terry Turbine—Type Z-2, 50 H.P.—2100 R.P.M., 145 Lbs. Steam with 30 lbs. back pressure, direct connected to
2 Byron Jackson—Type S-5"—2100 R.P.M.,—955 G.P.M. against a total head of 81 feet.
Turbine using natural gas for power, specific gravity 0.63 (air 1.00).

Test No.	1	2	3	4	5
Pump Speed, R.P.M.	1885	2070	2130	2210	2211
Water Rate, G.P.M.	1540	1650	1835	1937	2085
Gas Rate, M. cu. ft./24 Hrs.	1057	1122	1328	1432	1582
Temperature gas to turbine, °F.	268	266	266	266	269
Temperature gas out turbine, °F.	200	197	198	198	197
*Pressure gas to turbine, lbs./Sq. in.	184	182	170	164	156
Pressure gas out turbine, lbs./Sq. in.	1.5	1.5	1.7	2	2.2
Pressure water to pump, Ins. Hg. Vac.	1.5	2.5	3.0	3.5	4.5
Pressure water out pump, Lbs./Sq. in.	24.5	27.0	29.5	31.5	32.5
Total head pressure, Feet	58.3	65.2	71.5	76.7	80.2
Temperature water, °F.	70	65.0	65.5	65.0	71.0
Turbine, B.H.P.	29.5	35.0	42.0	47.5	53.5
Gas per B.H.P., M. Cu. Ft./24 Hrs.	35.8	32.1	31.6	30.2	29.6

*Pressure ahead of governor.

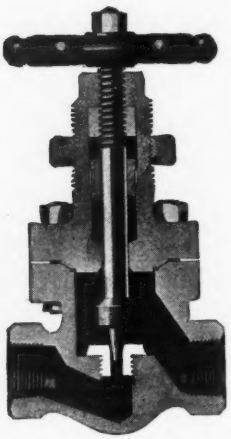


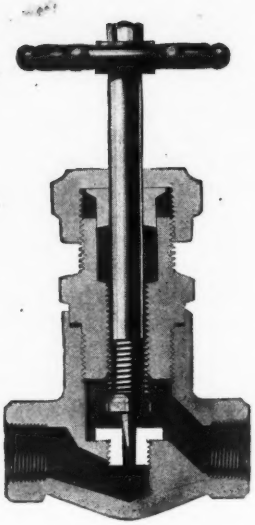


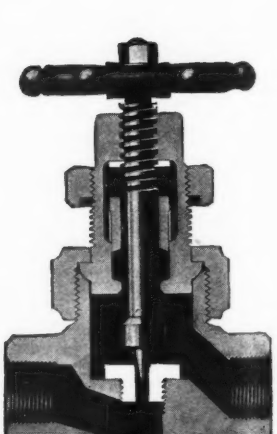
for Accurate Control.

Vogt needle point valves provide exactness of regulation not to be equaled in any other type valve. They are recommended for high pressure and temperature service on any line where close control is essential. They are drop forged entirely of plain open hearth or stainless steel. Union bonnet, bolted bonnet, or screw bonnet type all have removable or integral seats and range in size from ¼" upward.

Vogt
Drop Forged Steel
Needle Point Valves







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Manufacturers of—Oil Refinery Equipment, Drop Forged Steel Valves and Fittings, Water Tube and Horizontal Return Tubular Boilers, Ice Making and Refrigerating Machinery, Heat Exchangers.

The pressure drop through the heat exchangers is very low on the lean oil side and the pressure drop on the fat oil side depends upon whether the vapors are removed in the devaporizer tank or not. Higher transfer rates than those given in Table 3 were obtained with increased circulation rates.

The designed oil circulation of the lean oil for each unit was 260,000 gallons per day, but it is now 315,000 gallons and it is expected that the throughput will increase to at least 400,000 gallons per day without adding additional equipment other than pumps, which is a heavy overload.

It will be seen from Table 3 that the fat oil from the preheater is heated to within 6 degrees of the steam temperature to the preheater and the lean oil from the pressure heat exchanger is cooled to within 16 degrees of the fat oil temperature to the exchanger.

The temperatures in Table 3 were obtained by means of chemical thermometers with mercury filled wells and the same thermometer was moved from point to point and left in the thermometer well for at least 5 minutes after the reading had become constant to make sure that the correct temperatures were obtained and that the proper differences in temperature was obtained.

This eliminated errors between thermometers. For a test, the pressure exchanger was bypassed for a period of several hours and the temperature of the lean oil from the oil coolers was increased only 4 degrees Fahr.

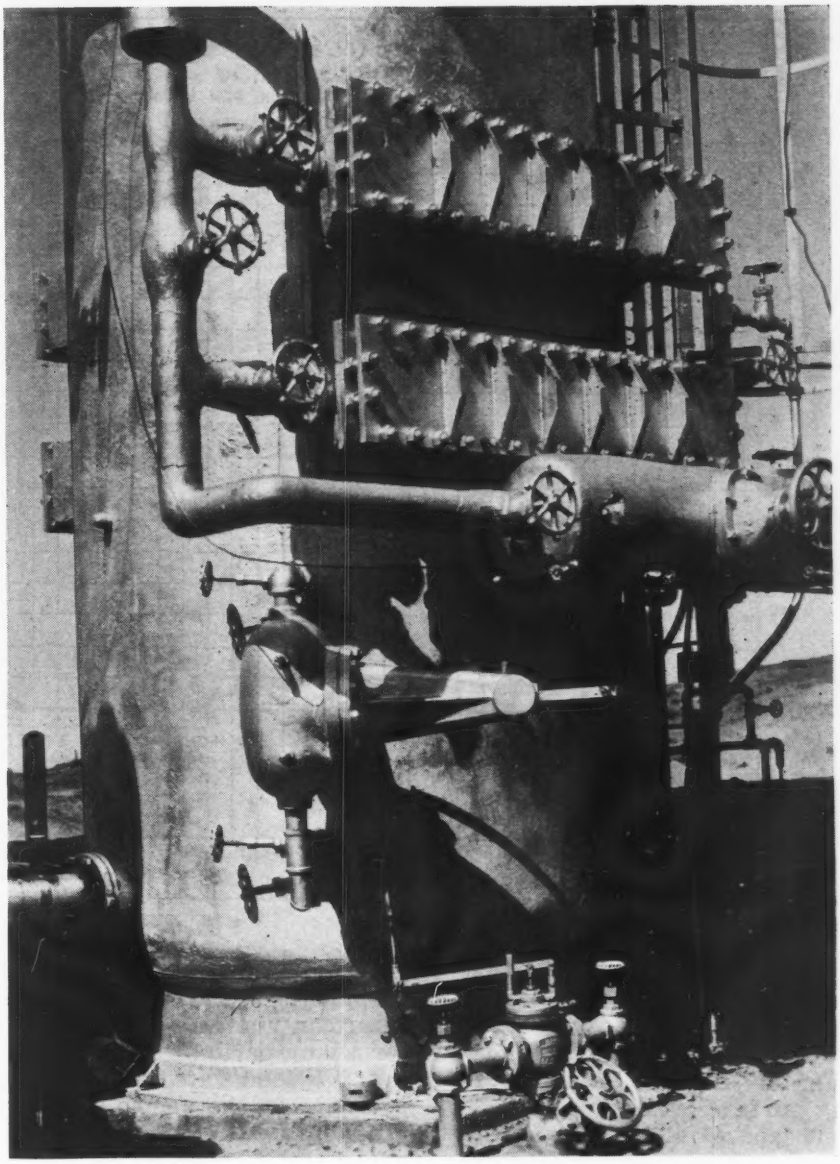

Fig. 5—Internal heaters in still of FW plant at Los Nietos

Table No. 3

Operating Results on Los Nietos Gasoline Plant

High Pressure gas, cu. ft./day @ 450 lb.	92,000,000
Low Pressure gas @ 40 lb.	3,500,000
Lean oil circulation gals./day	618,000
Gravity of lean oil	40° A.P.I.
Temperature high pressure wet gas to absorber	128°F.
Temperature high pressure dry gas from absorber	103°F.
Temperature fat oil from absorber	136°F.
Temperature fat oil to Pressure Heat Exchanger	129°F.
Temperature fat oil to Gravity Heat Exchanger	171°F.
Temperature fat oil to Preheater	270°F.
Temperature fat oil to Still	344°F.
Temperature steam to Preheater	350°F.
Temperature lean oil to Gravity Heat Exchanger	345°F.
Temperature lean oil to Pressure Heat Exchanger	212°F.
Temperature lean oil to Coolers	145°F.
Temperature lean oil to Absorbers	70°F.
Temperature gasoline from Condensers	66½°F.
Temperature water over Coolers and Condensers	65°F.
Pressure steam to turbines	145 lbs.
Temperature steam to turbines	510°F.
Pressure exhaust steam from turbines	39½ lbs.
Temperature exhaust steam from turbines to still	336°F.
Pressure drop lean oil thru Pressure Heat Exchanger	11.0 lbs.
Pressure drop lean oil thru Gravity Heat Exchanger	10.0 lbs.

Condensers and Coolers

Multipass coolers and condensers are installed in the cooling tower. Each cooler unit has 6 nozzles on each of the 2 headers. The cover plates are bolted to the body and the coolers can be baffled for from one to six passes through each exchanger by merely changing the baffles.

The baffling in the oil coolers has been changed to take care of the different oil rates to obtain a minimum pressure drop for a maximum heat transfer rate. The baffles and nozzles are shown on Fig. 7. These coolers permit connections at any point by merely drilling or cutting out the brake plate in each flange connection.

Rectifier

This unit is quite similar to other rectifiers except for the type of kettle. There is a 30-

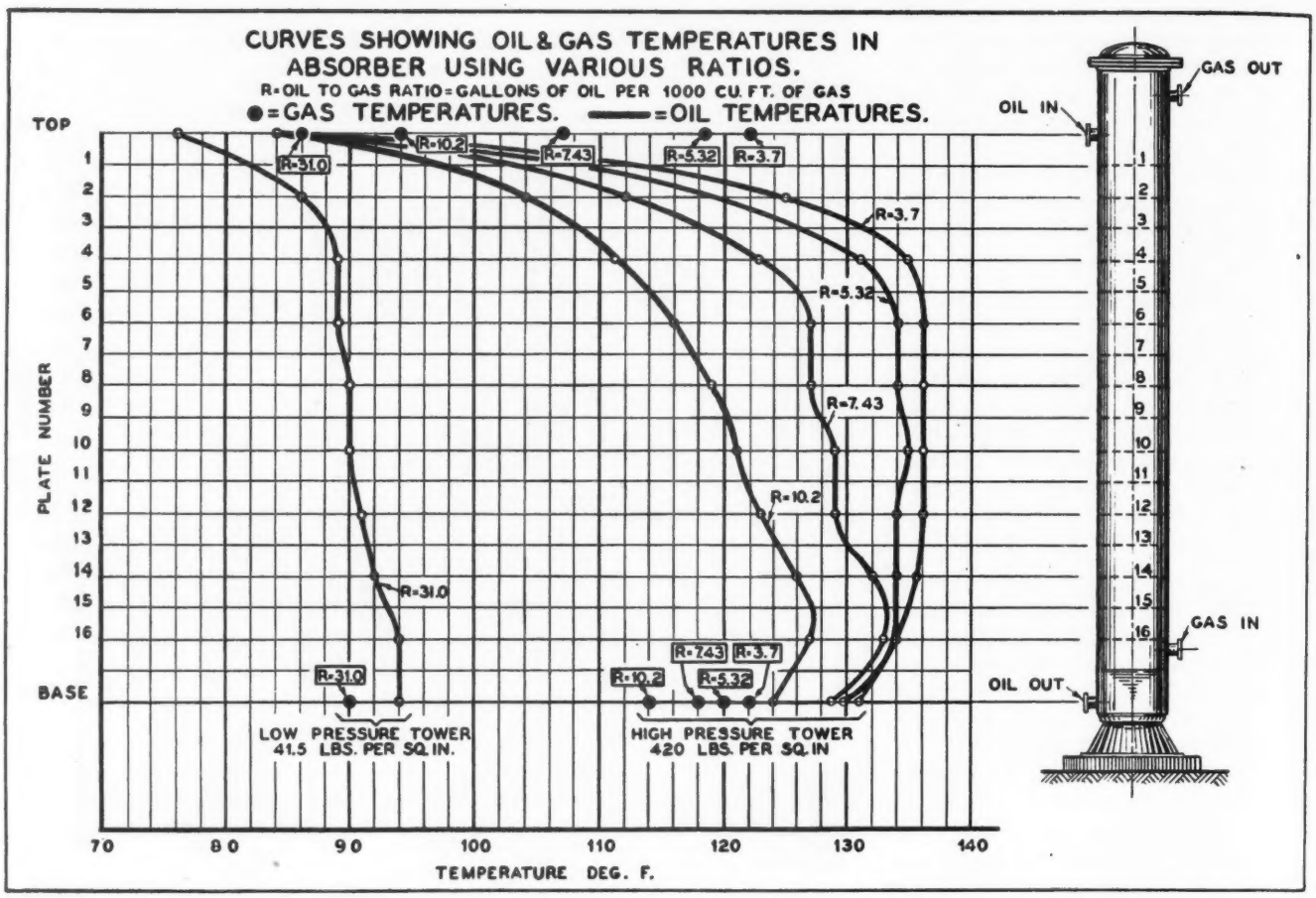

Fig. 6

inch cylinder 12 feet long with a flange on the lower half of the front end for the tube bundle. It has a large liberating surface and gives an excellent separation of the vaporizer fractions from the finished gasoline. The rectifier was designed for 75,000 gallons of finished gasoline per day. It is now making over 84,000 gallons and it is expected to make upwards of 100,000 gallons later. The rectifier has operated with a rate as high as 140,000 gallons of raw gasoline per day. The finished gasoline and overhead vapors from the rectifier are of the composition given in Table 1.

Controls and Regulators

The plant is equipped with automatic controls and regulators throughout. The rate of lean oil through each unit is set constant by a rate controller. The same is true of the raw feed to the rectifier and the reflux.

The rectifier raw feed pump takes suction from a 5000-gallon surge tank between the distillation unit final condenser and the rectifier. The tank has sufficient capacity that the rectifier can run at a constant rate for a long period without changing the feed rate. Should the pressure on the gas to the plant build up by the accidental closure of an outlet gas line there is an automatic bypass between the high pressure wet gas line and the stack which will open and relieve the pressure.

The back pressure on the plant is held constant by means of two-stage back pressure valves. The pressure is reduced from 450 to 180 pounds with one regulator and from 180 to 3 pounds with the second regulator.

Reduction in two stages has eliminated a lot of the cutting action on the regulator valve seats which was caused by high velocities where single stage pressure reduction has been used. Dual pilot gas regulators were installed in every case. To prevent rectifier pressure being applied to the low pressure storage, each storage tank has an individual safety valve set for 25 pounds relief pressure. Each tank is also connected to a common header. On one end of the header a pop safety valve is set for 25 pounds and on the other end there is a diaphragm back pressure valve set for 20 pounds.

The vapors are taken through the 20 pound back pressure valve to the compressor plant suction. The finished gasoline from the stabilizer is controlled by a balance lever valve on the rectifier kettle. Between this valve and the storage tanks there is a diaphragm valve which is wide open under normal conditions. Should the pressure on the line to storage tanks exceed 30 pounds this valve will close and prevent the flow of gasoline or vapor to the storage tanks.

There is also a bypass connected between the rectifier kettle and this diaphragm valve which will relieve the gasoline from the rectifier to the suction of the feed pump should the diaphragm valve close. These safety features will absolutely protect the low pressure storage against damage should a balance lever valve fail by

still help him It will give him a gasoline that needs the least permissible quantity of Ethyl fluid to bring it to Ethyl standard

Universal Oil Products Co
Chicago, Illinois

Dubbs Cracking Process
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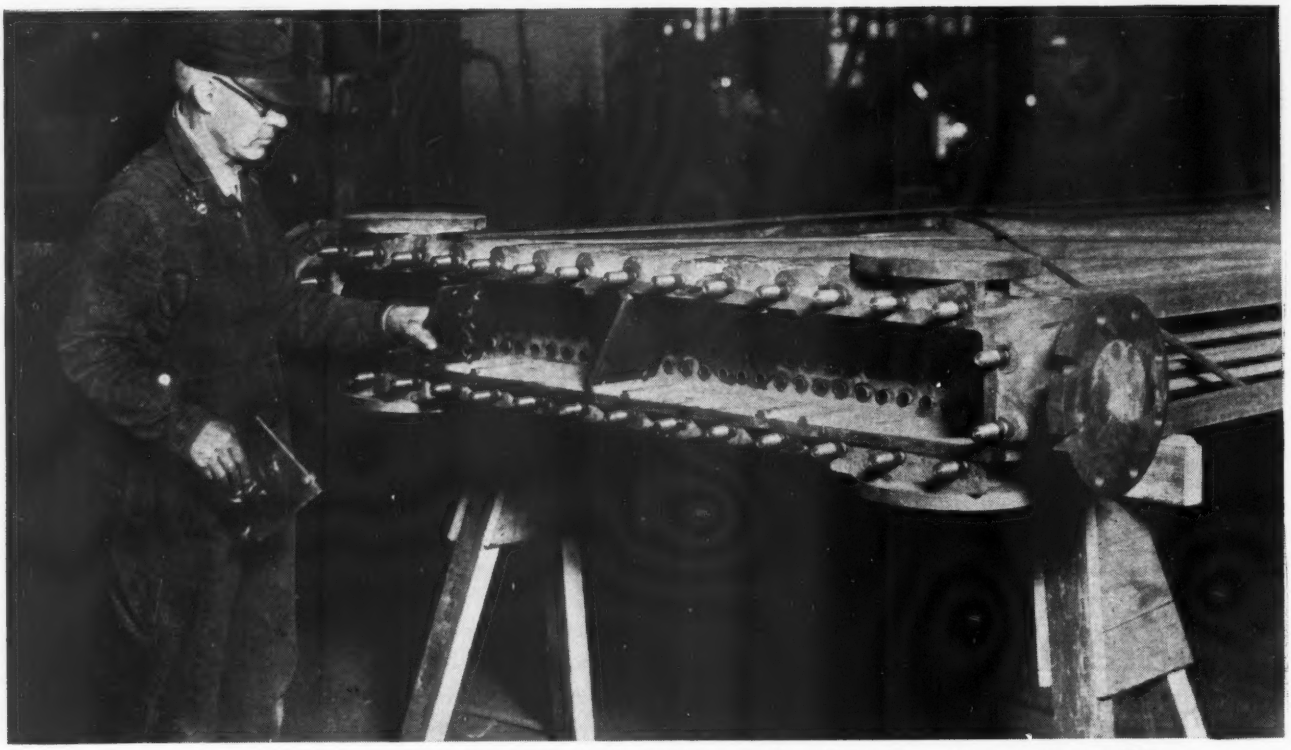


Fig. 7—Internal heaters, showing adjustable baffles mentioned in the accompanying article

sticking or unintentional manipulation.

Plant Equipment

The major equipment contained in the two units of this plant are as follows:

Nine—48 inches x 40 feet, 16 tray absorbers for 450 pounds working pressure.

One—72 inches x 43 feet, 16 tray low pressure absorber with 3 internal coolers. Each cooler has 900 square feet finned surface.

Four—930 square feet heat exchangers.

Two—480 square feet preheaters.

Two—72 inches x 39 feet stills with seven stripping trays and two internal heaters and seven fractionating trays.

Four—340 square feet Multipass primary condensers.

Six—340 square feet Multipass secondary condensers.

Eight—340 square feet Multipass oil coolers.

One—12 feet x 175 feet long x 38 feet high cooling tower with spray nozzles.

Five—150 H. P. H. R. T. boilers with water walls and superheaters.

Twelve—15,000 gallon gasoline storage tanks.

One—48 inches x 40 feet, 24 plate rectifier tower.

One—400 square feet rectifier heat exchanger.

One—420 square feet rectifier kettle.

One—230 square feet Multipass rectifier cooler.

Three—340 square feet Multipass rectifier condenser.

Test Legality of County Tax on Tank Cars

TULSA, Nov. 6.—A test case to determine, as a question of law, whether or not tank cars owned by persons, firms or corporations without refining facilities in the county are subject to an ad valorem tax is to be brought in Pottawatomie county, Okla. The case is expected to be closely watched by such organizations, as its outcome may set a precedent for future taxes, and tax assessments.

The Supreme Court of the state has held that tank cars not attached to a refinery as part of the refinery facilities are personal property, and as such are subject to an ad valorem tax at the domicile of the owner, or owners.

In September the Warren Petroleum Co. received notice from the tax ferret of Pottawatomie county that an assessment for 1929 had been made on 20 tank cars which the company had in the county on Jan. 1 of that tax year. These cars were serving plants not owned by the Warren Petroleum Co. and but one of the cars actually belonged to the Warren company, the remainder being either leased or borrowed.

Warren Petroleum Co. served notice of its intent to appeal the legality of the assessment. Warren Petroleum Co. is a foreign corporation, having Dover, Delaware, as its domicile. The company has no refinery in the county.

In support of the contention that the tank cars do not have a taxable situs in the county, where they had been sent for the temporary purpose of being loaded with natural gasoline, a quotation has been given from an opinion rendered by the state attorney general's office, in April, 1928, which says in part: "In order for rolling stock to be subject to the ad valorem tax of a county where said property appears to have been on January first of the tax year, the facts must show that said property has a fixed, permanent situs in said county, and is not only temporarily or casually there on said date."

Circulation Cuts Treating Costs, Gives Stable Gasoline

By D. F. Gerstenberger*

ONE of the most commonly used chemicals for the treatment of refined products in the refinery is litharge. It is one of those necessary evils which if economically handled does not add much to the cost of the finished product, but which if unsparingly used can run up the chemical costs rapidly.

Unfortunately, there are no set methods controlling its use which are applicable to the products obtained from each and every grade of crude, but the principles of its application must be worked out for each individual case.

Known to the trade as litharge, but to the chemical mind as lead oxide, its action is that of combining with sulfurs in the gasolines and kerosines removing them from the oils under treatment and forming lead sulfide.

This paper will cover in a general way the application of this material in several different ways, each being particularly suited to the material undergoing treatment, and will include ways of handling the lead sulfides produced from such treatment to reduce the quantity of fresh litharge required to a minimum.

The lead oxide is invariably combined with a water solution of caustic soda by agitating the litharge and soda solution until a saturated solution is obtained. Such a solution is commonly and generally spoken of as "Doctor Solution."

Gasoline obtained from so-called sweet crudes or crudes with a fairly low sulfur content can usually be treated with doctor in a closed continuous system, thereby eliminating the loss occasioned when the batch treatment and air agitation is used.

In many cases the lead sulfides themselves will continue to act as a treating agent on such gasolines, even when all trace of free litharge is gone from the doctor solution.

In some instances occasional additions of small quantities of litharge to the used doctor will give an excellent treating agent. Also in some instances either the lead sulfides or the used doctor may be continually reused by entering a small amount of compressed air or sodium hypochlorite in the discharge line of the gasoline circulating pump, assisting in bringing about "a break" by oxidation.

In many cases some sulfur must be added to the oil undergoing treatment, the quantity varying from one-hundredth of a pound to as high as one-tenth of a pound per barrel. The sulfur is apparently partly dissolved in the gasoline and then re-acts with the litharge.

By this reaction it brings with it combined sulfurs which would remain in the gasoline otherwise. The methods just given refer to straight-run gasolines which are quite easily treated.

Some straight-run gasolines, and most cracked gasolines resist quite strongly any effort to treat them with other than fresh doctor, revivified doctor, or reclaimed doctor. There are several methods of recovering

*Superintendent, American Oil Properties.

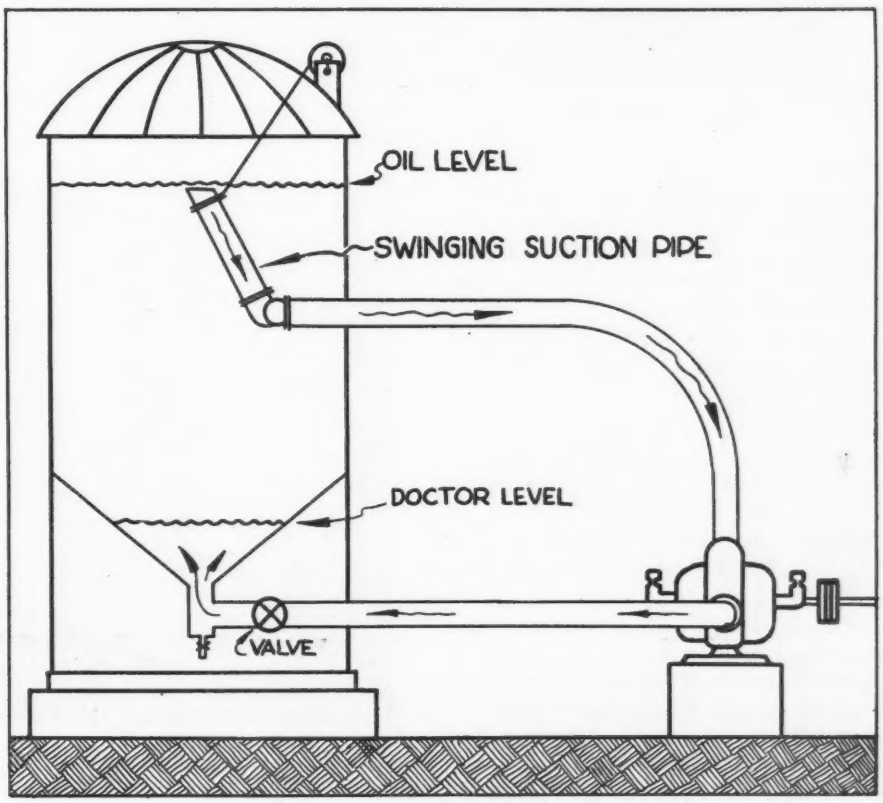


Fig. 1—Diagram of Circulating Systems For Batch Doctor Treater

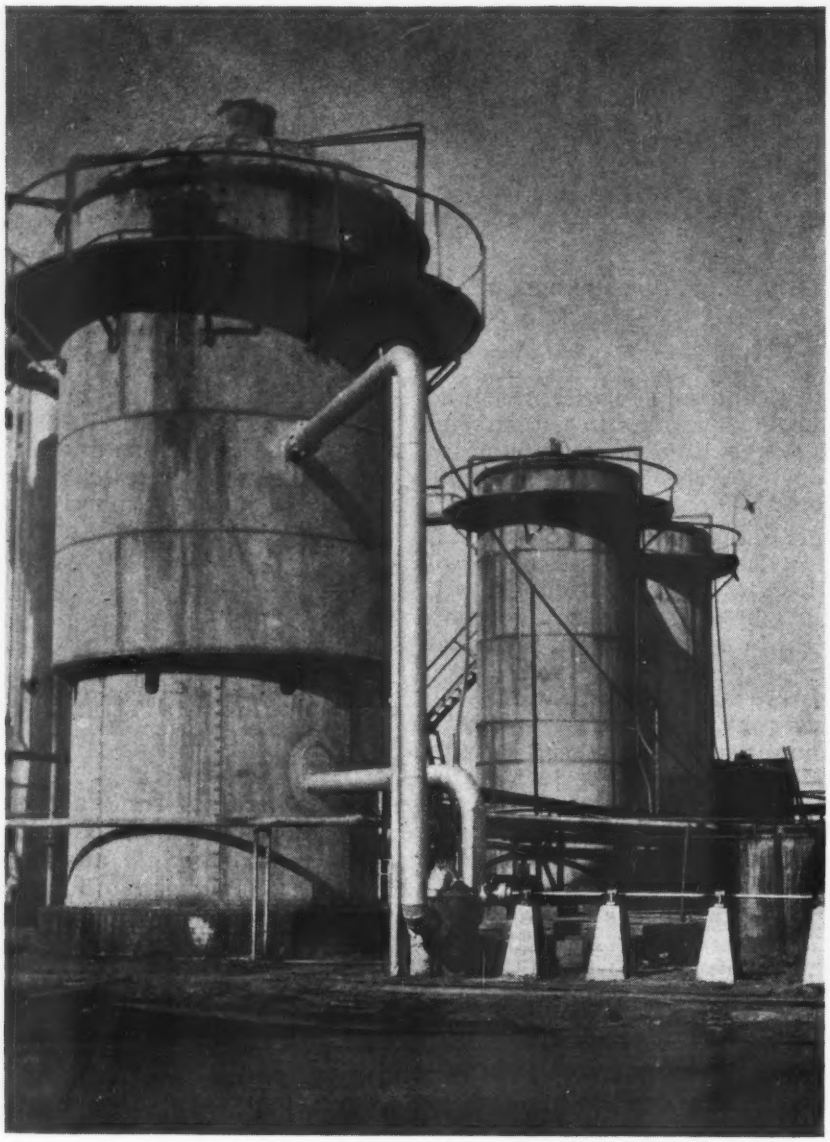


Fig. 2—Installation of Circulating System Shown in Fig. 1

doctor solution to an active state.

One is by heating the doctor and blowing it with air. This converts the lead sulfide partially to lead sulfate which in some instances make a good treating agent.

Where fresh doctor or its equivalent is needed a means of reclaiming the lead sulphide back into lead oxide should be installed. This method will be taken up a little later in this paper.

Gasolines which do not treat easily are best handled by batch treatment. The usual method of blowing with air should be avoided wherever possible for several reasons.

First, it causes a considerable treating loss due to evaporation.

Second, the vapors from the agitators cannot be safely drawn to the gasoline recovery plant when mixed with a large volume of air.

Third, gasolines which are susceptible to oxidation with an attendant loss of color, which is true of many cracked gasolines, cannot be treated to as stable a color by air agitation.

It is a conceded fact that when oxidation once starts in a gasoline that its progression is continually accelerated. The writer is of the opinion based on observation, that such gasolines remain much more stable in storage when treated by the circulating method as compared to the same product agitated with air during the treating process.

The ordinary agitator can be put to use, and when equipped with a proper circulating pump all the advantages of the continuous system can be had with careful and consistent treatment and results.

Fig. 1 shows an agitator so equipped which is giving excellent results from this method of treating.

The suction line is at the top in the agitator and is arranged so that it may be raised or lowered so as to take suction just below the surface of the oil. In this way the pump is not required to handle the total volume of the doctor solution, and the life of the pump is considerably lengthened as a result. The discharge of the pump

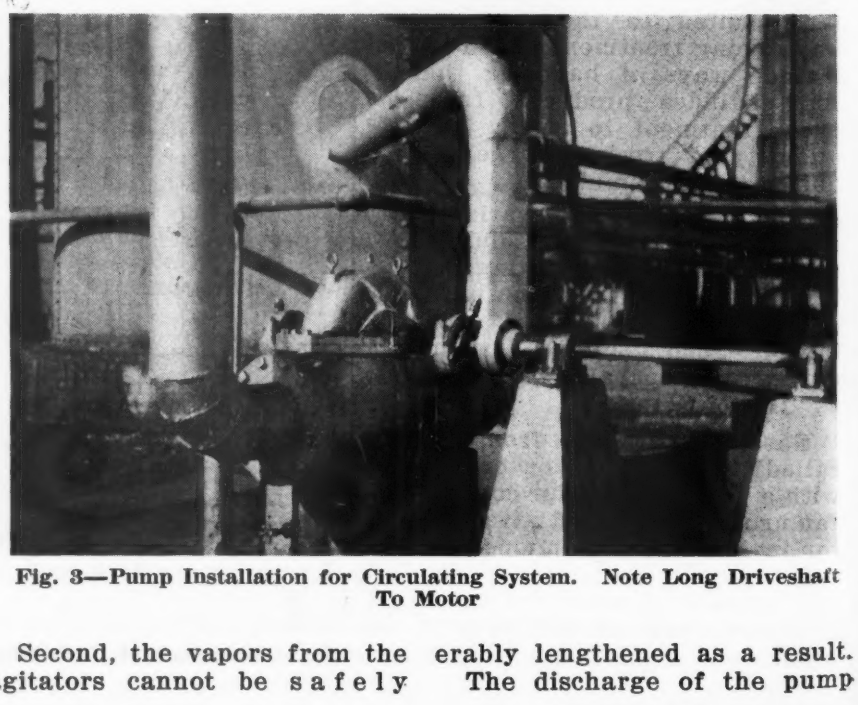


Fig. 3—Pump Installation for Circulating System. Note Long Driveshaft To Motor

enters the cone, the volume handled in this instance being 2200 gallons a minute. The pump is a low head, large volume centrifugal type requiring 10 H. P. to operate it. The use of this equipment has cut the treating loss in half when compared with air for agitation.

The advantages of its use over the closed continuous system are the carrying of the treatment to just the proper "break" with a minimum amount of doctor and sulfur and the uniform quality of the gasoline so treated.

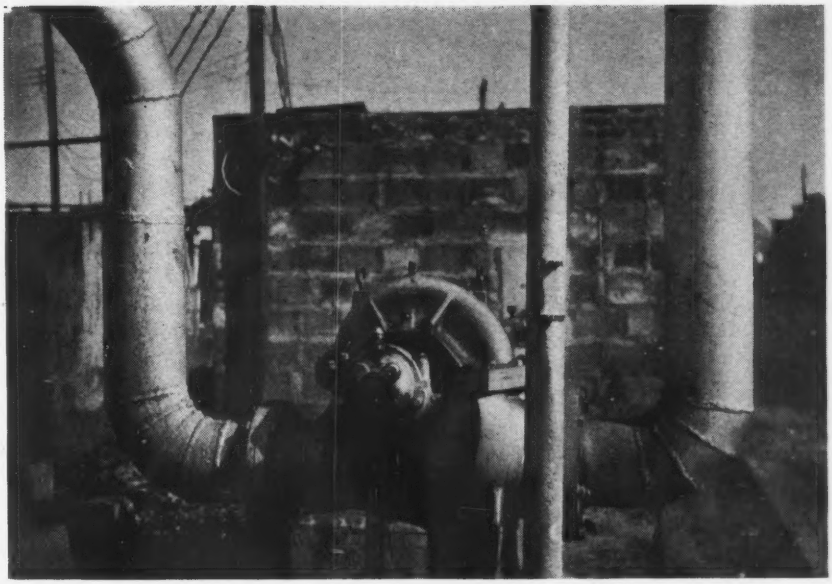


Fig. 4—Circulating Pump, With Housed Electric Motor in Background

F-C Litharge Recovery Process

Where the lead sulfides themselves or re-vivified doctor is satisfactory for continued treating, lead recovery is not necessary. Where an excessive amount of lead sulfides are formed and new doctor is required, a means of litharge recovery should be installed.

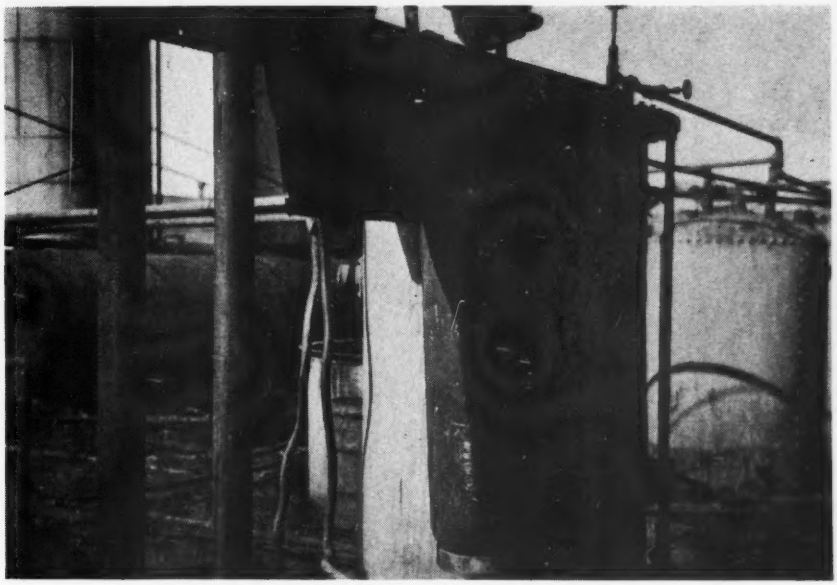


Fig. 5—F-C Lead Sulfide Convertor

There are several methods, but to the knowledge of the writer there is but one method of recovery back to true lead oxide or litharge. This is the F-C process and consists of oxidizing the sulfides with chlorine, forming free sulfur and lead oxide, with weak hydrochloric acid as a by-product. The re-action is primarily as follows:

$$PbS + 2Cl + H_2O = PbO + 2HCL + S$$

The actual cost of reclaiming is less than 5 cents per pound and where sufficient quantity of sulfides are handled per day this cost is around 3 cents per pound, the difference being that of the cost of chlorine in small and large quantities.

The reaction is brought about in a small convertor using a rotating paddle device inside to keep a thorough mixture of the incoming chlorine with the sulfides which have been suspended in water in the convertor.

The chlorine is fed in slowly and as the re-action progresses the lead oxide appears in a greyish looking precipitate.

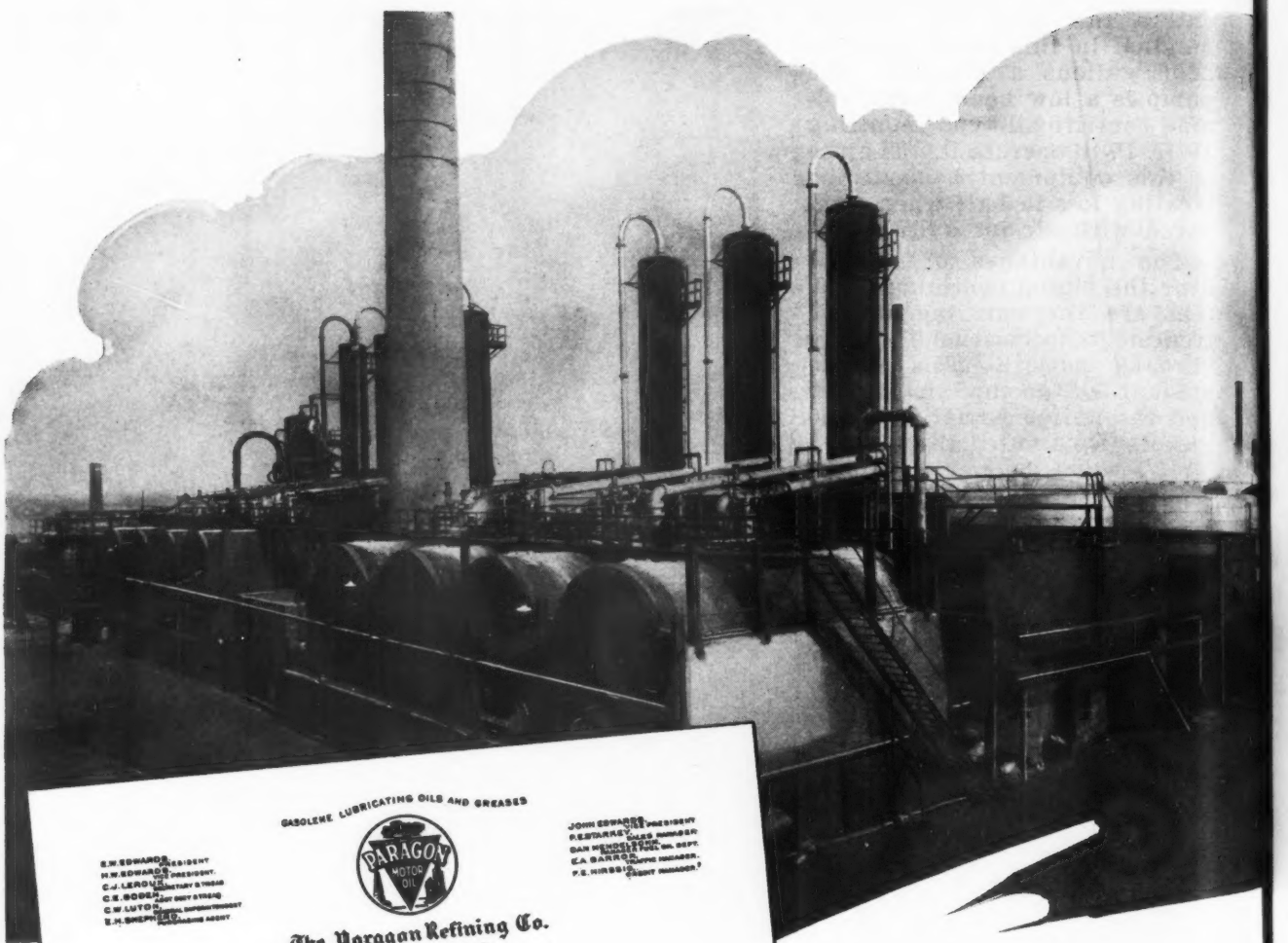
After the re-action is complete there are three distinct layers in the convertor, sulfur, weak HCl, and lead oxide. The first two are withdrawn and the sulfur washed with water in a small wash tank to remove all traces of acid.

The lead oxide can be readily washed in the convertor until free of all acid and is then removed in a wet state where it can be readily redisolved to make up new "doctor."

This reclaimed lead seems to be superior as a treating agent for sweetening cracked gasoline, which is undoubtedly accounted for by the fact that it is more finely divided than is new lead.

The accompanying pictures show the first commercial installation of the F-C process which was erected from materials on hand in the plant for a cost of about $500 and which is capable of re-claiming 1000 pounds of lead sulfide per day.

Truscon Steel Co., Youngstown, O., has retained Wharton Clay, formerly commissioner of the Associated Metal Lath Manufacturers, to promote friendly service to its customers. Mr. Clay is reputed to be one of the outstanding architectural and contracting engineers in the country, according to the company, was organizer of the National Council for Better Plastering, has been a contributor to many architectural and trade publications and has written or collaborated on several books on lathing and plastering.



GASOLENE LUBRICATING OILS AND GREASES

PARAGON MOTOR OIL

The Paragon Refining Co.
TOLEDO, OHIO.

April 2nd, 1930

The Brown Instrument Company,
Philadelphia, Pa.

Gentlemen:

Your equipment controlling the flow of reflux liquid to the dephlegmators on our shell still battery has been in continuous operation for almost six years. Throughout this period, these instruments have always functioned accurately with very little attentions.

We are well satisfied with their performance, also with the regular inspections they are given by your service department.

Very truly yours,

THE PARAGON REFINING COMPANY.

M. E. Schulz
Chief Engineer.

MES:MY

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". . . these instruments have always functioned accurately with very little attention."

THE PARAGON REFINING COMPANY

M. E. Schulz
Chief Engineer

Brown

To Measure

Blending Natural Gasoline To Volatility Specifications

By R. C. Alden* and M. Gage Blair*

IN THE past, the A. S. T. M. distillation data have been used almost entirely as a means of specifying the volatility of motor fuels. With the growing emphasis on Reid vapor pressure as the best safeguard against vapor lock it has become desirable to include this factor as a volatility specification.

From a specification viewpoint the use of vapor pressure greatly simplifies blending. The calculations involved in blending to a desired vapor pressure are almost as simple as those required in blending to a desired gravity.

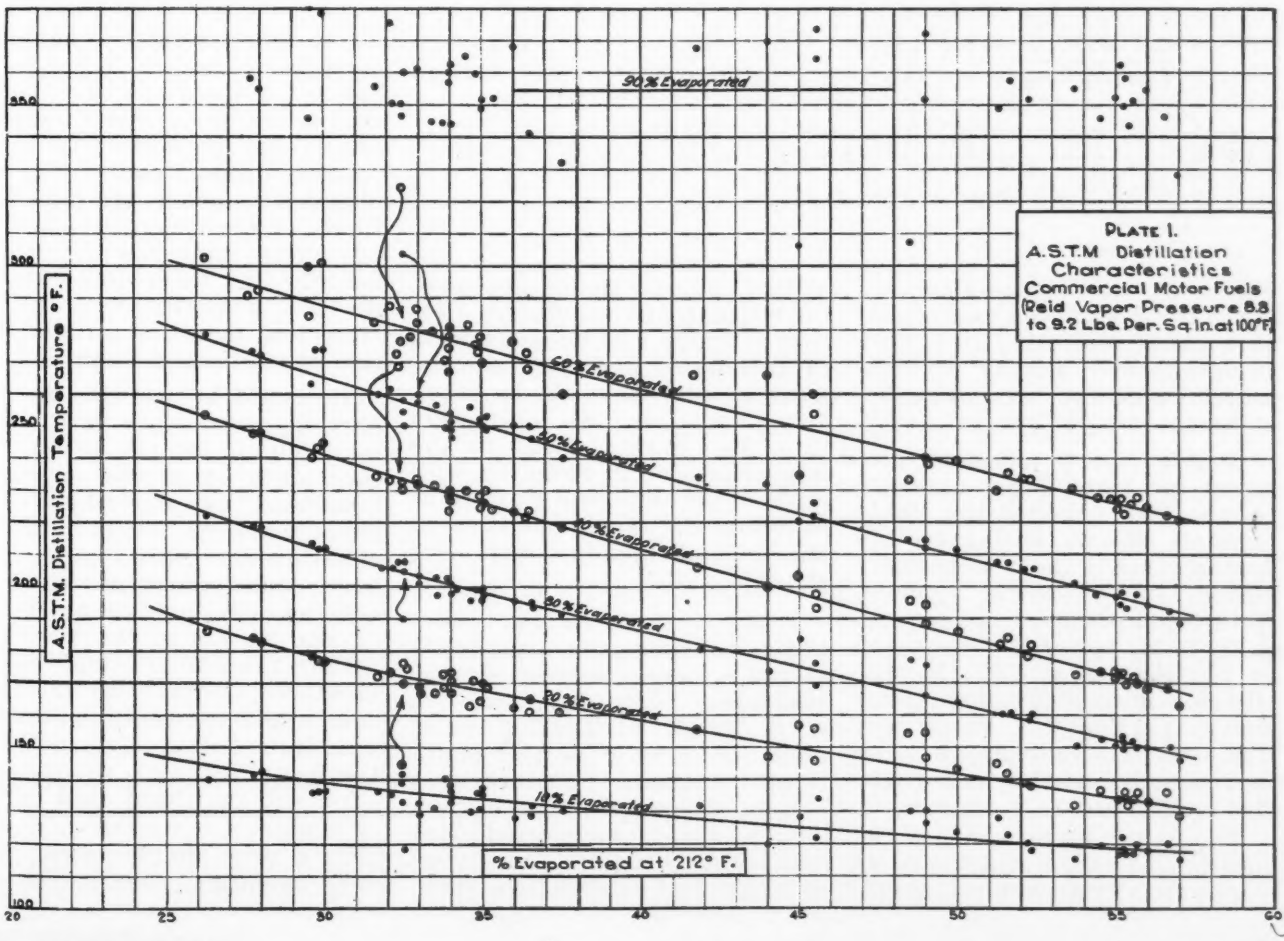
The Reid vapor pressure needs no material correction for barometric pressure and is complicated by no such uncertain variable as is distillation loss in the A. S. T. M. distillation. Furthermore, a vapor pressure specification is in itself a fairly definite measure of vapor-locking tendencies, a quality that has proven extremely difficult to evaluate in terms of the A. S. T. M. distillation.

Another factor which apparently is not generally realized is that with a Reid vapor pressure specification, it is necessary to specify only one A. S. T. M. distillation point in the middle of the distillation curve to maintain the following items of motor fuel performance within comparatively narrow limits:

(1) Vapor locking tendencies
(2) Ease of starting
(3) Warming up ability
(4) Acceleration

Plate 1 is offered as demonstration of the above statement. The chart shows the relationship existing between the A. S. T. M. per cent evaporated at 212°F. and the front portion of the A. S. T. M. distillation curves for 54 samples of commercial motor fuels having Reid vapor pressures between 8.8 and 9.2 pounds per square inch at 100°F. The commercial motor fuels shown in Plate 1

*Phillips Petroleum Co., Research Dept.



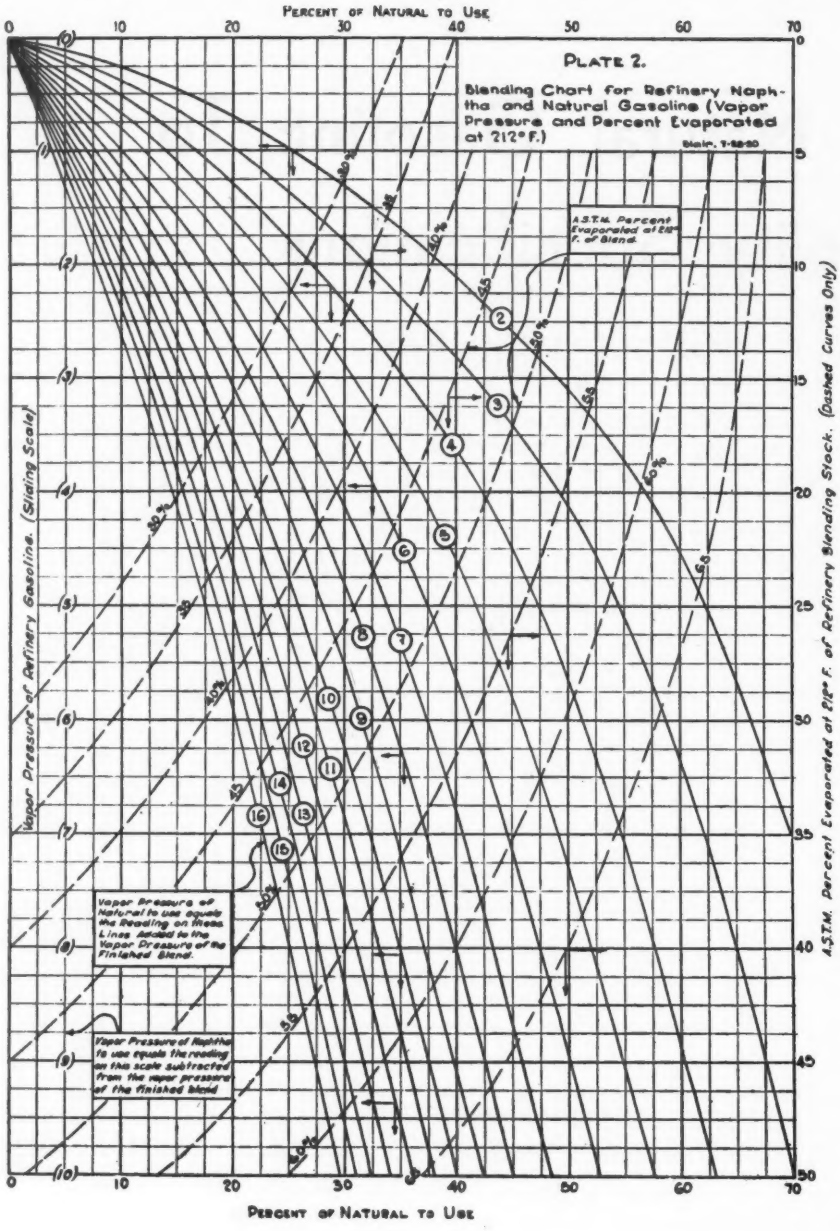


PLATE 2.
Blending Chart for Refinery Naphtha and Natural Gasoline (Vapor Pressure and Percent Evaporated at 212° F.)
Vapor Pressure of Refinery Gasoline. (Sliding Scale)
A.S.T.M. Percent Evaporated at 212° F. of Refinery Blending Stock. (Dashed Curves Only)
PERCENT OF NATURAL TO USE
Vapor Pressure of Natural to use equals the Reading on these Lines added to the Vapor Pressure of the Finished Blend.
Vapor Pressure of Naphtha to use equals the reading on this scale subtracted from the vapor pressure of the finished blend

represent all the samples falling in the designated vapor pressure range, collected in a very comprehensive survey of commercial gasolines extending over an interval of several years.

Similar charts could be prepared for other vapor pressure ranges. It is believed the single example shown will serve to demonstrate the generality stated. Thus, with a given Reid vapor pressure and a given A. S. T. M. per cent evaporated at 212°F., the A. S. T. M. distillation is fixed within narrow limits, particularly those portions which have been proven to be indicative of the four qualities cited above.

The other factors of motor fuel performance which are at least partially dependent on volatility characteristics are power, mileage and crankcase dilution. These can be attributed largely to the heavier materials used in blending. It is taken for granted in this discussion that the characteristics of the naphthas used in blending with natural gasoline will be such as to maintain these qualities of the finished blends within reasonable limits.

It has been stated that blending to a vapor pressure specification is comparatively simple. Likewise, blending to an A. S. T. M. distillation point near the middle of the distillation curve is comparatively simple. It has been demonstrated that these two specifications can serve to define four items of motor fuel performance within reasonably narrow limits. It, therefore, follows that blending natural gasoline to volatility specifications can be reduced to very simple relationships.

For highly accurate work blending to vapor pressure specifications is not a simple matter. Raoult's Law expresses the relationship and includes as factors, the vapor pressures and molecular per cents of the components. It is, of course, impractical to determine the molecular weights of the components in the blending of natural gasoline. Moreover, all blended mixtures do not exactly follow Raoult's Law.

For practical purposes, the authors have developed a very empirical expression of Raoult's Law, which appears to yield quite satisfactory results in blending natural gasoline to vapor pressure specifications. The equation is as follows:

$$\frac{V_n G_n P_n + V_g G_g P_g}{G_n P_n + G_g P_g} = V_b, \text{ where}$$

V = vapor pressure
G = A.P.I. gravity
P = volume per cent
Subscript $_n$ = Naphtha, or heavy gasoline
" $_g$ = light gasoline
" $_b$ = blend

The above empirical equation is based on the fact that the significant numbers of the A. P. I. gravities of the predominant hydrocarbons in motor fuel are roughly proportional to the significant numbers of the quotients of their specific gravities by their molecular weights. Substituting these quotients for A. P. I. gravities, restores the empirical equation to the precise expression of Raoult's Law.

It would be possible to prepare an alignment chart, which included all of the seven factors involved in the empirical equation just described. The chart, however, would be rather complicated. Here again it has been found more practical to eliminate at the expense of accuracy certain of the variables rather than to attempt refinements beyond the limits of actual application. By assuming a definite relationship between the gravities and vapor pressures of the light and heavy components it is possible to prepare a very simple vapor pressure blending chart. The as-

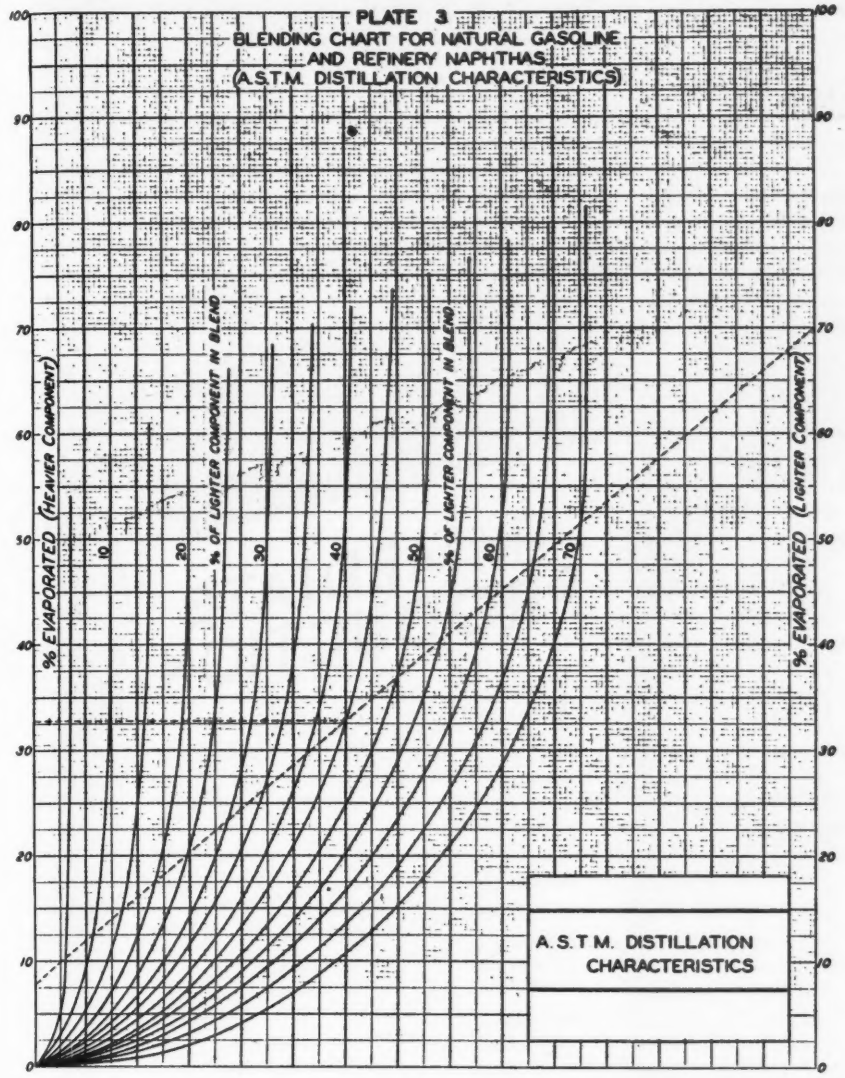


PLATE 3
BLENDING CHART FOR NATURAL GASOLINE AND REFINERY NAPHTHAS
(A.S.T.M. DISTILLATION CHARACTERISTICS)
% EVAPORATED (HEAVIER COMPONENT)
% OF LIGHTER COMPONENT IN BLEND
% OF LIGHTER COMPONENT IN BLEND
% EVAPORATED (LIGHTER COMPONENT)
A.S.T.M. DISTILLATION CHARACTERISTICS

sumptions made were as follows:

	Gravity (°A.P.I.)	Reid Vapor Pressure (Lbs. / Sq. In. @ 100°F.)
Refinery Gasoline	52	1.8
	56	5.4
	60	9.0
	64	12.6
Natural Gasoline	74	9
	82	18
	88	27
	94	36

An examination of these assumptions will indicate that they are fairly well founded on average conditions. Furthermore, considerable deviations from the assumptions could not materially influence the results obtained within the limits of accuracy of commercial blending and testing. Actual use of the simple vapor pressure blending chart thus made possible has repeatedly demonstrated its practical accuracy.

A graphical presentation of these relationships is to be found in Plate 2, from which it is possible to read the results of any blend combination up to 70 per cent natural in the finished product directly. This plate delineates the approximate vapor pressure relationships that exist in blending natural gasoline and refinery naphthas.

The horizontal ordinate is the percentage of natural gasoline in the blend. The vertical ordinate (numerical values on the left in parentheses) is the difference between the vapor pressure of the finished blend and of the refinery blending stocks in pounds per square inch. The solid curves represent the difference in vapor pressure in pounds per square inch between the natural gasoline and the finished blend as designated by the numbers on the individual curves.

An important factor to remember in the use of the vapor pressure relationships shown in Plate 2 is that the upper left hand corner (the point of convergence of the solid curves) is the vapor pressure of the finished blend. The vertical ordinate represents deviations of the vapor pressure of the finished blend from the vapor pressure of the naphtha; while the numerical values of the solid curves represent deviations of the vapor pressure of the finished blend from the vapor pressure of the natural gasoline.

There are four major variables in any blending problem concerning vapor pressure, in which there are two components blended together in varying amounts. These variables are:

Vapor pressure of the heavier component

Vapor pressure of the lighter component

Vapor pressure of the finished blend

Percentage relationship of the components

Any one of these variables can be determined from Plate 2, when the other three are known. Examples given below will illustrate the use of the chart to find each of the four variables when the other three are known.

(a) Blending Percentages Unknown

The following variables are known:

Vapor pressure of refinery stock—7.0 pounds

Vapor pressure of natural gasoline—16.0 pounds

Vapor pressure of blend—10.5 pounds

The upper left hand corner in this case represents the blend vapor pressure of 10.5 pounds. Since the refinery blending stock has a 7.0 pound vapor pressure, the difference is 3.5 pounds. The difference between the vapor pressure of the finished blend and the natural gasoline is 5.5 pounds.

Starting from 3.5 on the left hand ordinate a horizontal line is drawn to the point of intersection with the 5.5 curve, then a perpendicular to the line at the intersection drawn to the base line of the graph will indicate 32 per cent of natural gasoline, leaving a balance of 68 per cent of refinery blending stock necessary to make the desired finished product.

(b) Vapor Pressure of Refinery Stock Unknown

Vapor pressure of natural gasoline—18 pounds

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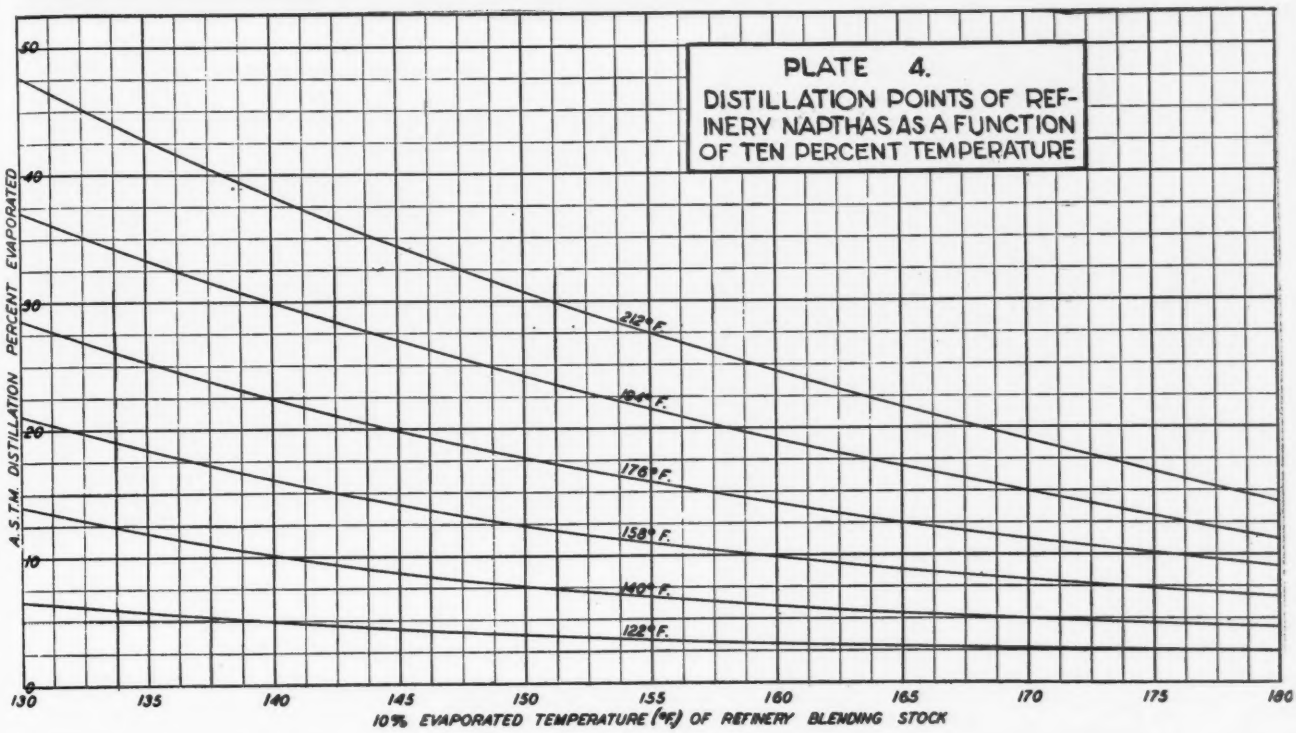


Vapor pressure of blend—12 pounds

Blending percentages—60 per cent refinery stock, 40 per cent natural gasoline

The difference between the vapor pressure of the finished blend and the natural gasoline is 6.0 pounds, consequently the curve governing the case is the one marked 6.

Reversing the procedure of the problem above, draw a perpendicular from 40 per cent on the base line to the number 6 curve. From this intersection draw a horizontal to the left hand ordinate. The horizontal line intersects the left hand ordinate at 5.7, which deducted from 12 pounds indicates 6.3 pounds as the vapor pressure of the refinery blending stock.

(c) Vapor Pressure of Natural Gasoline Unknown

Vapor pressure of refinery blending stock—6.0 pounds

Vapor pressure of finished blend—8.5 pounds.

Blending percentages, 35 per cent natural gasoline, 65 per cent refinery stock

Deducting the refinery stock vapor pressure of 6.0 pounds from the 8.5 pounds vapor pressure of the finished blend establishes the point on the left hand ordinate at 2.5. A horizontal line from 2.5 intersects a vertical line from 35 per cent natural on the base line at a point 0.4 of the distance from No. 3 to No. 4 curve; hence 3.4 added to 8.5, the vapor pressure of the finished blend, gives 11.9 as the requisite vapor pressure of the natural gasoline.

(d) Vapor Pressure of Blend Unknown

Vapor pressure of refinery blending stock—6.5 pounds

Vapor pressure of natural gasoline—13.0 pounds

Blending percentages—45 per cent natural gasoline, 55 per cent refinery stock

This example probably represents the least common use of the graph. It is also the most complicated.

To make this use of the chart clear it is necessary to use symbols, as follows:

Let P_r = vapor pressure of refinery gasoline

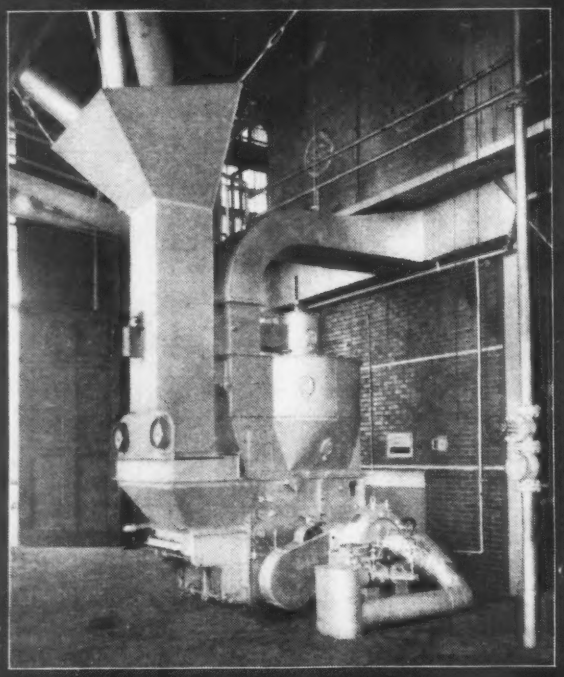
P_n = vapor pressure of natural gasoline

P_b = vapor pressure of blend

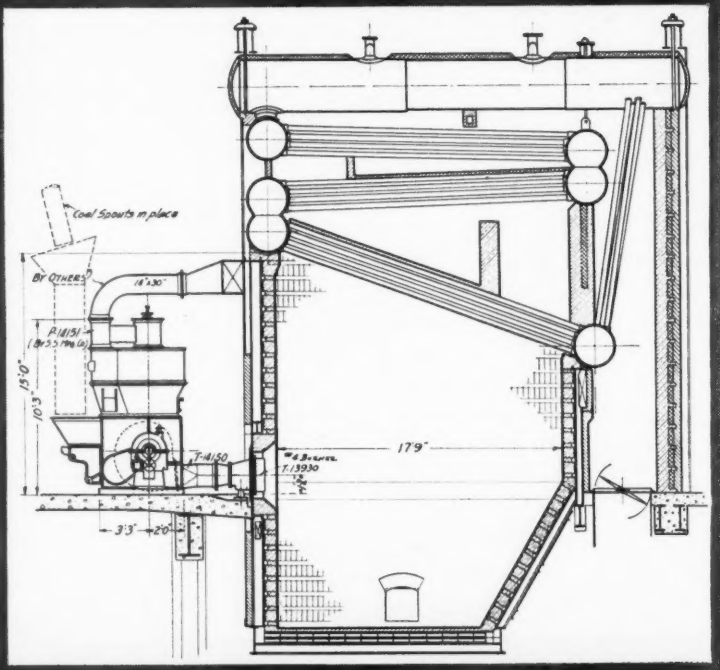
Then the values represented by the left hand ordinate can be expressed by the formula $P_b - P_r$. Similarly the numerical values of the solid curves can be represented by the formula $P_n - P_b$. The sum of these two values is $P_n - P_r$ or the difference between the vapor pressures of the natural and refinery gasolines. Hence, the point on the given percentage line, where the sum of the numerical values of the vertical ordinate and the solid curve is equal to the difference between the vapor pressures of the two components is the point solving this problem.

In the problem stated, the difference between the vapor pressures of the two components is 6.5 pounds (13.0 — 6.5) and the percentage of natural is 45. Following the line upward from 45 per cent natural, noting the sum of the values of the solid curves and the left hand ordinate, it will be found that the sum of these two values is 6.5 at the point where the 45 per cent perpendicular intersects the solid curve of 2.9 and the value on the left hand scale is 3.6. The vapor pressure of the blend must be, then, 10.1, since 6.5 + 3.6 and 13 — 2.9 both equal 10.1.

In order to make Plate 2, a complete chart for blending natural gasoline, the dashed curves have been added to Plate 2 to provide means of blending to a specified A. S. T. M. per cent evaporated at 212°F. The right hand axis of Plate 2 represents the A. S. T. M. per cent evaporated at 212°F. of the naphtha. The dashed curves represent the same quality of the finished blend plotted against the horizontal scale of "Per Cent of Natural to Use." The dashed curves are based on the assumption that natural gasoline has an A. S. T. M. per cent evaporated at 212°F. of 89



September 10, 1930



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per cent. This assumption is true within narrow limits for practically all commercial natural gasolines.

As an example of the use of Plate 2 as a guide to the selection of quantity and quality of natural gasoline to use in blending refinery naphthas to the volatility specifications the following illustration is cited:

Assume that a refinery has a naphtha with a Reid vapor pressure of 6.5 pounds per square inch and an A. S. T. M. per cent evaporated at 212°F. of 25, and that a finished blend is desired with a Reid vapor pressure of not more than 10.0 pounds per square inch and an A. S. T. M. per cent evaporated at 212°F. of not less than 40.

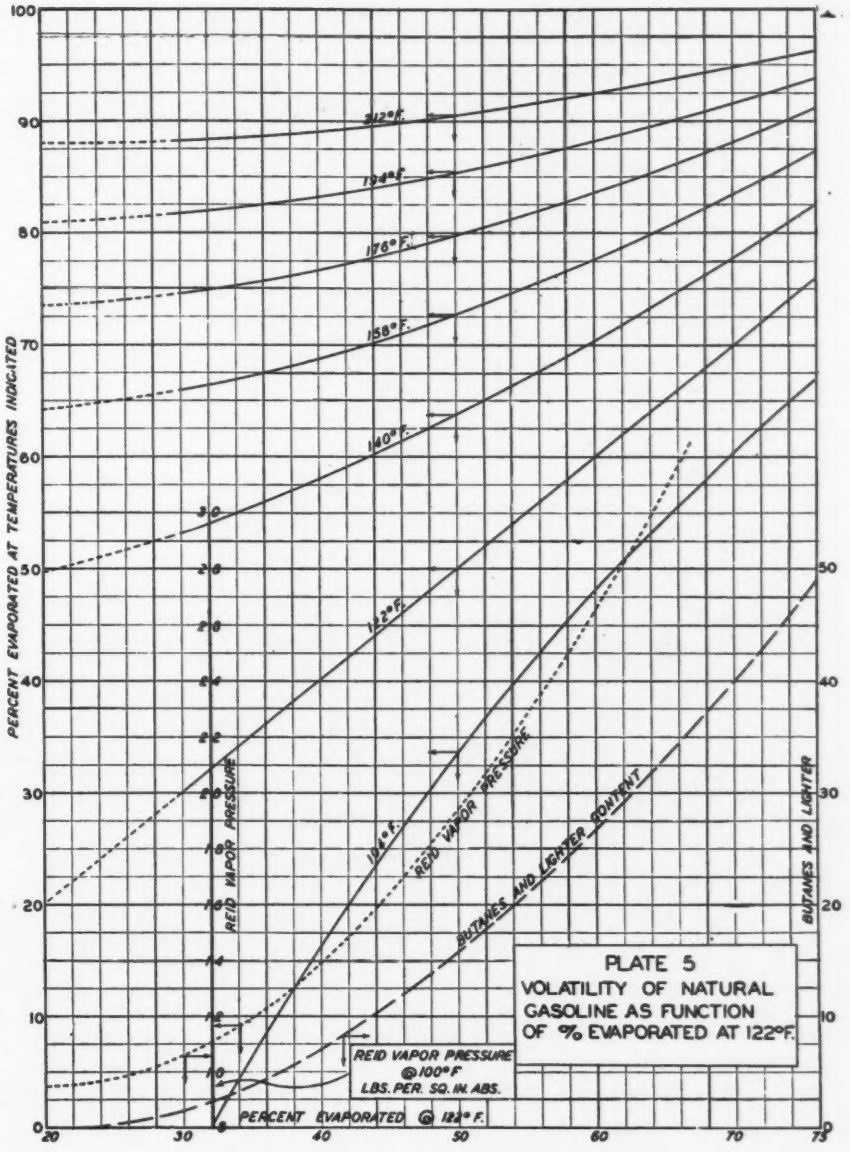
The first step in the solution is to determine the *quantity* of natural gasoline that must be used to assure the desired A. S. T. M. distillation characteristics. On the 25 ordinate of the right hand scale read from the dashed curve designated 40, the per cent of natural to use, which is 26.5 per cent.

The next step is to determine the *quality* of natural to use from the vapor pressure curves. At the intersection of the 26.5 ordinate of the horizontal scale and the 3.5 (10 — 6.5) ordinate of the left hand scale read 8, the value of the solid curve. The Reid vapor pressure of the natural gasoline to use for this blend would be 10 + 8, or 18 pounds per square inch. From the conditions assumed, the Reid vapor pressure of the natural gasoline must not be more than 18 pounds per square inch and the per cent of natural gasoline in the blend must not be less than 26.5.

For practical blending of natural and refinery gasolines to definite volatility specifications, Plate 2 provides a very simple and convenient graphical relationship.

In blending natural gasoline to A. S. T. M. distillation characteristics, a large number of specification points are in practice. A method has already been presented for blending to the A. S. T. M. per cent evaporated at 212°F. There follow several charts which show more complete relationships in regard to A. S. T. M. distillation data.

Plate 3 is a chart for determining the A. S. T. M. distillation characteristics of a blend from

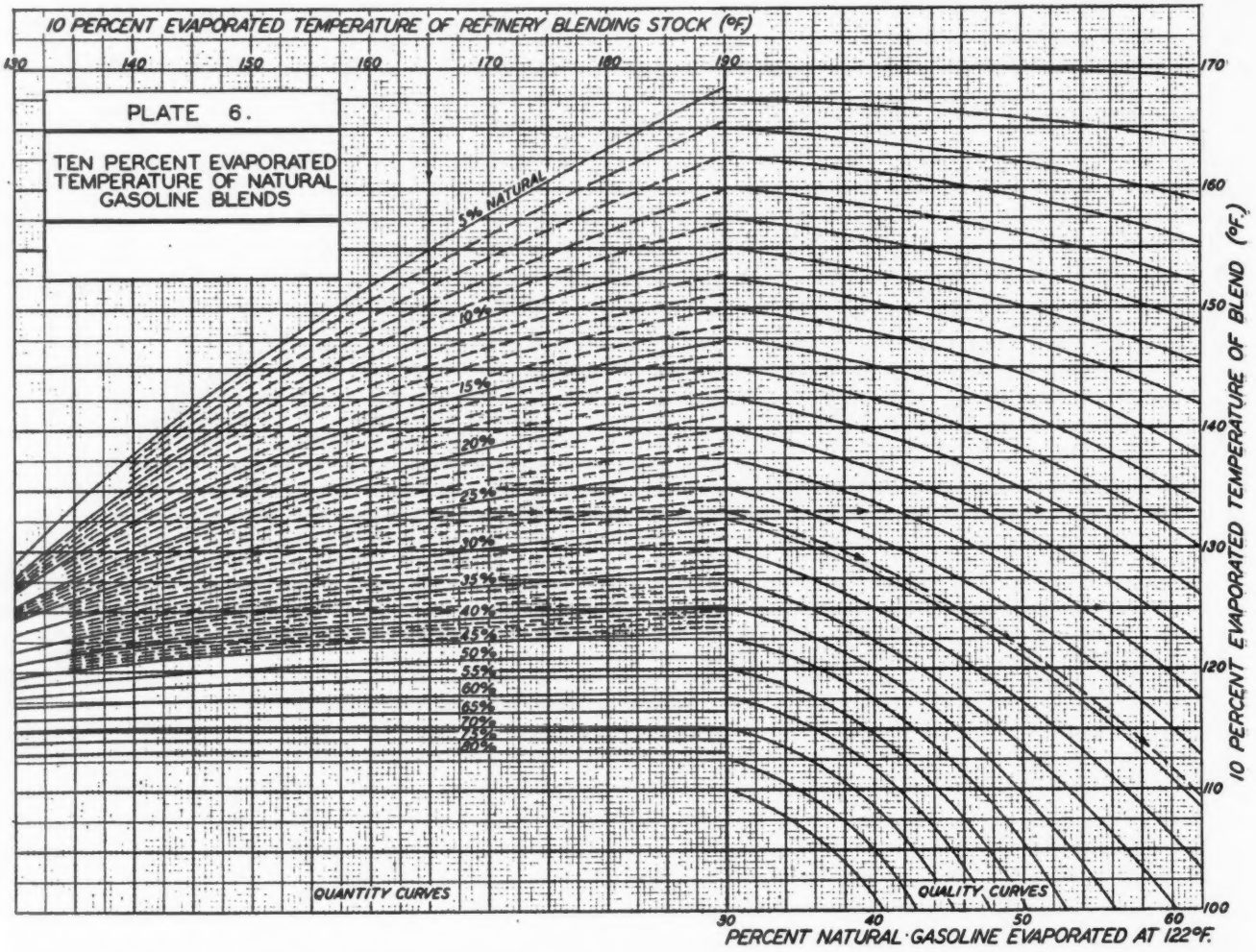


the known A. S. T. M. distillation characteristics of the two components. A single A. S. T. M. distillation point or the entire A. S. T. M. distillation of the blend can be determined. Obviously the chart can be used for determinations converse to those stated.

Plate 3 is comparatively simple. The important point to remember in its use is that it is a nomographic chart and can therefore be interpreted only by means of straight lines extending from one extreme axis to the other extreme axis. These straight lines, of course, can be determined by any two of the three possible points, namely a point on left hand axis, a point located between the axes and a point on the right hand axis.

Another important point to remember in the use of Plate 3 is that the two axes are in terms of per cent evaporated (A. S. T. M. distillation) at any desired temperature between 100 and 212°F. Finally, a single straight line across the chart must be on a constant A. S. T. M. distillation temperature basis for the natural gasoline, the refinery naphtha and the finished blend.

To use the chart it is necessary to have at hand the A. S. T. M. distillation data of the two materials which it is desired to blend. With this information it is possible to predict the distillation curve of the resultant blend up to a temperature of 212°F. or slightly higher. As a case in point to illustrate the use of the chart, let it be supposed that a refinery blending stock has 8 per cent evaporated at 150°F. in the A. S. T. M. distillation and a natural gasoline has 70 per cent evaporated at the same temperature. It is desired to know



what will be the A. S. T. M. per cent evaporated at 150°F. of a blend containing 45 per cent of the natural gasoline.

To solve, draw a line across the chart from 8 per cent on the "Heavier Component" axis to 70 per cent on the "Lighter Component" axis. From the point at which this line intersects the 45 per cent "Lighter Component in Blend" curve, draw a horizontal line to the "Heavier Component" scale. The point at which this horizontal line intersects the scale indicates that 33 per cent of the blend will be evaporated at 150°F.

If this procedure is followed for a series of distillation temperatures from the A. S. T. M. data of two blending materials and the points plotted on co-ordinate paper the resultant curve will very closely approximate the actual A. S. T. M. distillation of the blend. As an example of the prediction of a complete A. S. T. M. distillation curve of a blend, the following example is cited.

Distillation Temperature	Per Cent Evaporated: Refinery Blending Stock	Natural Gasoline Blending Stock	Predicted Blend (45% Natural Gasoline)
I.B.P.	100°F.	80°F.	(a)
100°F.	1.0%	30.0%	6.0%
110°F.	2.0%	40.5%	11.4%
120°F.	2.8%	49.5%	16.6%
130°F.	3.9%	57.5%	22.2%
140°F.	4.6%	64.3%	26.7%
150°F.	8.0%	70.0%	33.0%
160°F.	10.5%	74.5%	37.0%
170°F.	13.5%	78.3%	41.3%
180°F.	16.6%	81.6%	45.2%
190°F.	20.0%	85.0%	48.8%
200°F.	23.5%	87.6%	52.3%
210°F.	27.4%	90.0%	55.8%
220°F.	31.5%	92.2%	59.2%
Loss	1.0%	6.0%	(a)

Note (a)—No attempt is made to predict the initial boiling point and distillation loss.

Note (a)—No attempt is made to predict the initial boiling point and distillation loss.

Experimental tests of the chart, in which the actual A. S. T. M. distillation data were known, have been made for a wide diversity of blends with highly satisfactory results, thus proving that predicted data can be considered very reliable.

In using Plate 3 in connection with high boiling naphthas or for A. S. T. M. distillation temperatures below the initial boiling point of the naphtha, it is necessary to use negative values for the percentages evaporated of the naphtha. These negative values are determined by projecting the A. S. T. M. distillation curve to the desired temperature, following the trend of the curve but exaggerating the downward rate of curvature. The negative values thus established are applied to the left hand axis of the chart.

Plates 4 and 5 are supplementary graphs devised to make it possible to estimate blend results from Plate 3 by assuming average Engler data from a minimum of information concerning the two components.

The curves of Plate 4 are the average A. S. T. M. distillation data for blending materials available at one refinery at temperatures from 122°F. to 212°F. plotted against the temperature

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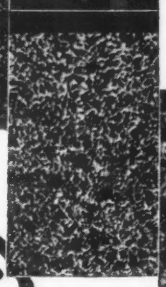

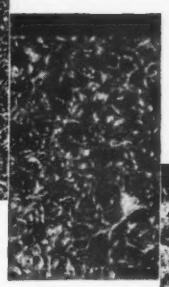

These four photomicrographs show magnifications (100X) of steel of substantially the same chemical composition. Variation is due to heat treatment. Selection of the right heat treating specifications protects Edward users.

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at which 10 per cent is evaporated. If the 10 per cent evaporated temperature or the per cent evaporated at any given temperature (preferably between 140 and 176°F.) is known, the corresponding data on a vertical axis through the chart will represent average Engler characteristics at this particular refinery. Similar charts can be prepared to represent the average products at any refinery.

Plate 5 is a similar chart to that of Plate 4, but the data is for natural gasolines. The per cent evaporated at a series of temperatures from 104 to 212°F. are plotted against the per cent evaporated at 122°F. In this graph the per cent evaporated at 122°F. is taken to indicate the quality of the natural with respect to front end volatility.

A dash curve is plotted across the lower portion of the chart, which indicates the approximate butanes and lighter to be expected as a function of per cent evaporated at 122°F. Similarly a dotted curve represents the Reid vapor pressure which will probably exist for each set of conditions. To avoid confusion of ordinates the vapor pressure scale is plotted on a line which rises vertically from the base line of the graph between the 30 and 40 per cent evaporated points on the horizontal scale.

To illustrate the use of these Plates (3, 4 and 5) in combination, complete hypothetical data is tabulated below, which has been secured from the plates. In the case of the refinery gasoline the 10 per cent evaporated temperature, 158°F., was known and in that of the natural gasoline it was known that 40 per cent was evaporated at 122°F.

Distillation Temperature	Refinery Product (Plate 4)	Per Cent Evaporated Natural Gasoline (Plate 5)	35% Blend (Plate 3)
104	....	16.5	....
122	3.0	40.0	9.6
140	6.5	58.0	20.0
158	10.0	68.5	27.7
176	14.5	76.5	34.5
194	20.0	83.0	41.3
212	25.5	88.5	47.3 (1)
Vapor Pressure	6.75	14.0	9.85 (2)
Butanes & Lighter Component	....	7.0	....

Note (1) 47.5% as determined by Plate 2.
(2) Determined from Plate 2

Plate 6 shows the blending relationships existing for the A. S. T. M. ten per cent evaporated temperatures. Demonstration lines serve to illustrate the use of the graph. In the case represented a refinery blending material which has 10 per cent evaporated at 165°F. is blended with 25 per cent of natural gasoline. The illustration is broad enough in scope to show the effect of natural gasoline products varying in per cent evaporated at 122°F. from 30 to 60 per cent. This corresponds to natural gasolines varying in butanes and lighter content from butane-free to approximately 30 per cent butane which is in the grade AA range.

It will be observed that the demonstration line starts at 165 on the upper scale and drops perpendicularly into the family of "Quantity Curves" below to the 25 per cent natural curve. From this point it proceeds horizontally to the division line between the two sections of the graph. Up to this point the procedure is the same for any grade of natural gasoline.

Assuming the natural gasoline to be butane-free, the horizontal line is simply extended to the extreme right hand scale of the graph to indicate that a 10 per cent evaporated temperature of the finished blend of 133°F. is to be expected. Had the natural gasoline blending material been one in which 46 per cent were evaporated at 122°F., then the horizontal line would have been deflected at the dividing line between the two sections of the graph to follow the family of "Quality Curves" to a point directly above 46 per cent on the base line from which point it would proceed horizontally to the right hand scale of the chart, and indicate a 10 per cent evaporated temperature of 125°F.

Had the natural gasoline in the blend had 60 per cent evaporated at 122°F., the ten per cent evaporated temperature of the blend would have been 109°F. It is quite obvious that when the 10 per cent evaporated temperature of the refinery blending material and the per cent evaporated at 122°F. of the natural gasoline are known, the approximate 10 per cent evaporated temperatures of the resultant blends may be readily obtained.

Knowing any three of the four factors (ten per cent evaporated temperatures of naphtha, per cent of natural in blend, the per cent evaporated at 122°F. of natural gasoline and the ten per cent evaporated temperature of the finished blend) the fourth can be determined from Plate 6.

In establishing the relationships shown in this report, the A. S. T. M. per cent evaporated at 122°F. was chosen as the basis of comparison of natural gasoline for the following reasons:

(1) For wide variations in pentane ratios, the per cent evaporated above and below 122°F. are more constant than for other temperatures considered.

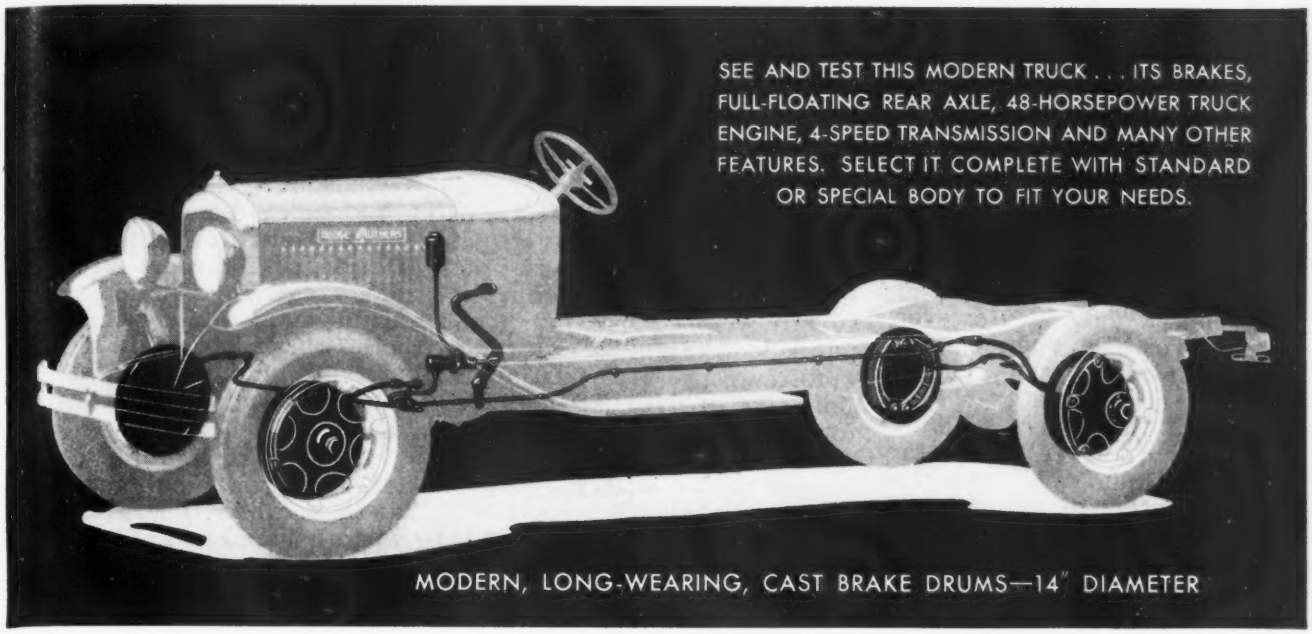
(2) In the case of butane-free gasolines, the per cent evaporated at temperatures much below 122°F. lose their significance.

(3) 122°F. is far enough along in the distillation to largely eliminate the effect of room temperature.

(4) 122°F. in the A. S. T. M. distillation of motor fuels is almost as low as one can expect to predict with accuracy.

Plates 3 and 6 are based on a series of blending experiments in which natural gasolines having pentane ratios of slightly less than 50 per cent were used. The charts would not be entirely accurate, particularly in the lower temperature ranges, if the pentane ratio were considerably different from this value. It is believed the charts will be practically accurate when using natural gasolines with pentane ratios between 38 per cent and 58 per cent.

When using natural gasolines of unusually low pentane ratios, the per cent of natural gasoline as predicted by Plates 3 and 6 to accomplish a given result will be low. Similarly, with natural gasolines of high pentane ratio, Plates 3 and 6 will indicate a too high per cent of natural gasoline. The propane contents of the naturals used in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the blending experiments ranged from zero in the B. F. gasoline to 1.5 per cent in the 30 per cent butane natural. Except with unusual excesses of propane, this factor would not affect results materially.

The A. S. T. M. distillation temperature curves of Plate 5 are based primarily on the natural gasoline used in the blending experiments. However, these curves have been checked against some extreme natural gasolines and found to closely approximate actual A. S. T. M. distillation data. In Plate 5 the curves for Reid vapor pressure and for content of butanes and lighter are based entirely on the natural gasolines used in the blending experiments and therefore can not be considered generally applicable. These last two curves can, however, be applied reasonably accurately to natural gasolines having moderate contents of propane with pentane ratios of about 48 per cent.

The A. S. T. M. distillation data in this work were determined at a barometric pressure of 745 m.m. For considerably lower barometric pressure, differences due to this factor must be taken into consideration.

In conclusion the charts included here (particularly Plates 2 and 3) provide a complete and workable means of blending natural gasoline to volatility specifications under the majority of conditions. Plate 2 can be used in all cases where the finished product must meet a vapor pressure specification or must meet, in addition, a specification for per cent evaporated in A. S. T. M. distillation at 212°F. or must meet the latter specification alone.

Plate 3 can be used in practically all cases where the finished product must meet specifications for A. S. T. M. temperatures, particularly below 212°F. Plates 4 and 5 are designed to facilitate the use of Plate 3 by expressing general relationships between several A. S. T. M. distillation points and key specifications for the components of a blend. Plate 6 can be used in cases where the finished product must meet a specification for the ten per cent evaporated temperature in the A. S. T. M. distillation.

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There are in addition tables of dimensions for standard wrought iron or steel pipe, tables giving properties of saturated and superheated steam, relative discharging capacities of standard and extra strong pipe, metric conversion tables, logarithms, decimals and other tables.

Among the devices described and illustrated are bronze and iron gate, globe, angle, cross and check valves; fire protection service valves and fittings; drilling gate and line gate valves; forged steel unions, fittings and flanges; fabricated piping, steel, iron and brass pipe; brass, malleable iron, cast iron screwed and flanged, and cast iron drainage fittings; wrought nipples; chrome-nickel iron cast pipe and fittings; drive well points; pipe tools and other products.

* * *

Foster Wheeler Corp., 165 Broadway, New York City, has issued a new bulletin describing a new type of waste heat boilers.

The boilers consist of heating elements built of seamless steel tubes covered with cast iron extended surface, reamed to size and shrunk on the heating tubes. They are more compact per square foot of heating surface than has previously been the case with such equipment.

Several of the boilers described have been in operation for more than a year. The first installations were made in connection with the exhaust gases from diesel engines. It has been found that in this service the boilers act as excellent mufflers, no additional muffling devices being used under ordinary conditions.

Another interesting departure from usual boiler practice is that when operated with waste heat gases not exceeding 800 degrees F., it is not necessary to by-pass the boilers for protection, even when dry. Repeated tests, in operation have shown that the boilers are not damaged when used as mufflers alternately with and without water. A further characteristic of much interest to operators is the self-cleaning tendency, it having been found that the exhaust gases from diesel engines tend to keep the heating surface clean so that soot blowing is eliminated from operating on exhaust gases from internal combustion engines.

The catalog shows several designs, installations and details of construction which will be of interest to those having waste gases at temperatures above 500 degrees. The bulletin, WB-30-2, is available upon request.

* * *

Shand & Jurs Co., Berkeley, Calif., has just published its Bulletin No. 52 which gives full engineering details including drawings, weight, size and material specifications of the company's tank fittings. Curves are presented showing capacities of vacuum and vent valves and explosion vent reliefs.

The book includes information on vacuum and pressure valves, cable sheave brackets, cable winches, gauge and thief hole hatches, swing joints for floating decks, swing joints for swing pipes, automatic tank gauges, steel nozzles, internal valves and other special fittings.

Copies will be furnished on application to the company.

ADVERTISING PAGES REMOVED

Effect of Time and Temperature In Treating Cracked Distillate

By R. B. Pierce*

IN THE general course of daily refinery operation for the manufacture of gasoline from cracked distillate there has been noticed considerable variation in the sulfur content, the color of the finished product, the color stability of the finished product and the cost of neutralization of the finished product.

The raw cracked distillate, as produced from the cracking coils, is a material, the characteristics of which, varied but slightly from week to week. Hence the variations in the finished product must be due to the method of handling the raw distillate before rerunning. In order to determine the various factors which enter in and cause the variation in finished product, considerable work has been done in the laboratories of the Louisiana Oil Refining Corp. in the investigation of the factors involved in the subsequent handling and acid treating of raw cracked distillate for the production of a finished rerun material which would be of good color, have good color stability and a sulfur content below that specified under U. S. Motor gasoline.

The factors which were considered in this investigation were as follows:

I. Effect of time of acid contacting.

II. Effect of amount of steam used in distillation.

III. Effect of storage time before rerunning.

IV. Effect of water washing after acid treat.

V. Effect of caustic washing after acid treat.

VI. Effect of temperature.

VII. Effect of settling time.

In order that the entire investigation could be carried to conclusion with no variation in the original stock, a large sample of a caustic washed cracked distillate was procured. Parts used for each separate determination and the various factors to be considered were handled separately and the extent of the variability of the factor determined, 1000 c. c. of oil was treated in each case and 800 c. c. of the oil so treated was distilled in a one liter distillation flask through a Hempel fractionating column.

The overhead from the subsequent distillation was passed through 100 c. c. of N/16 sodium carbonate solution to absorb the acid products of distillation. After distillation the entire overhead was back-titrated with N/16 hydrochlorite acid to determine the amount of acid formed during the distillation.

Complete tests, as indicated in the below tabulation and attached graphs, were made on the overhead material and it is to be noted especially the effect of time of acid contacting on the color, sulfur and sulfuric acid formed in the distillation. It is indicated that as far as these three determinations are concerned; namely, color, sulfur and acid formation, that best results are obtained by contacting acid and oil for a period of between three and five minutes.

*Louisiana Oil Refining Corp.

I

Effect of time of agitation

	a.	b.	c.	d.	e.	f.
Amount of oil c.c.	1000	1000	1000	1000	1000	1000
Lbs. acid / bbl. oil	10	10	10	10	10	10
Time of agitation (Min)	1	3	6	15	30	
Time of settling (Min)	5	5	5	5	5	5
Time of caustic wash (Min)	1	1	1	1	1	1
Time before rerunning	2 da	2 da	2 da	2 da	2 da	
Amount of oil rerun	800	800	800	800	800	
% Overhead	84	84	84	84	84	
% Steam	6	6	6	6	6	
Tests on overhead—						
Gravity	54.5	54.4	54.5	54.2	54.4	
I. B. P.	126	128	132	125	128	
% 158	4.5	3.5	4	3.5	3.5	
% 212	21	18	20	18	17.5	
% 221	21.5	21	22	20.5	20	
% 284	48	48	49	47.5	48	
% 392	93.5	94	94	94	94	
End Point	420	420	418	420	420	
Recovery	98	98	98	97.5	97.5	
Color	24	24	24	23	19	
Corrosion	OK	OK	OK	OK	OK	
Doctor	Sour	Sour	Sour	Sour	Sour	
Sulphur	0.12	0.105	0.09	0.08	0.07	
Grams sulphuric acid / bbl.	3.1	5.1	9.2	43.5	86	

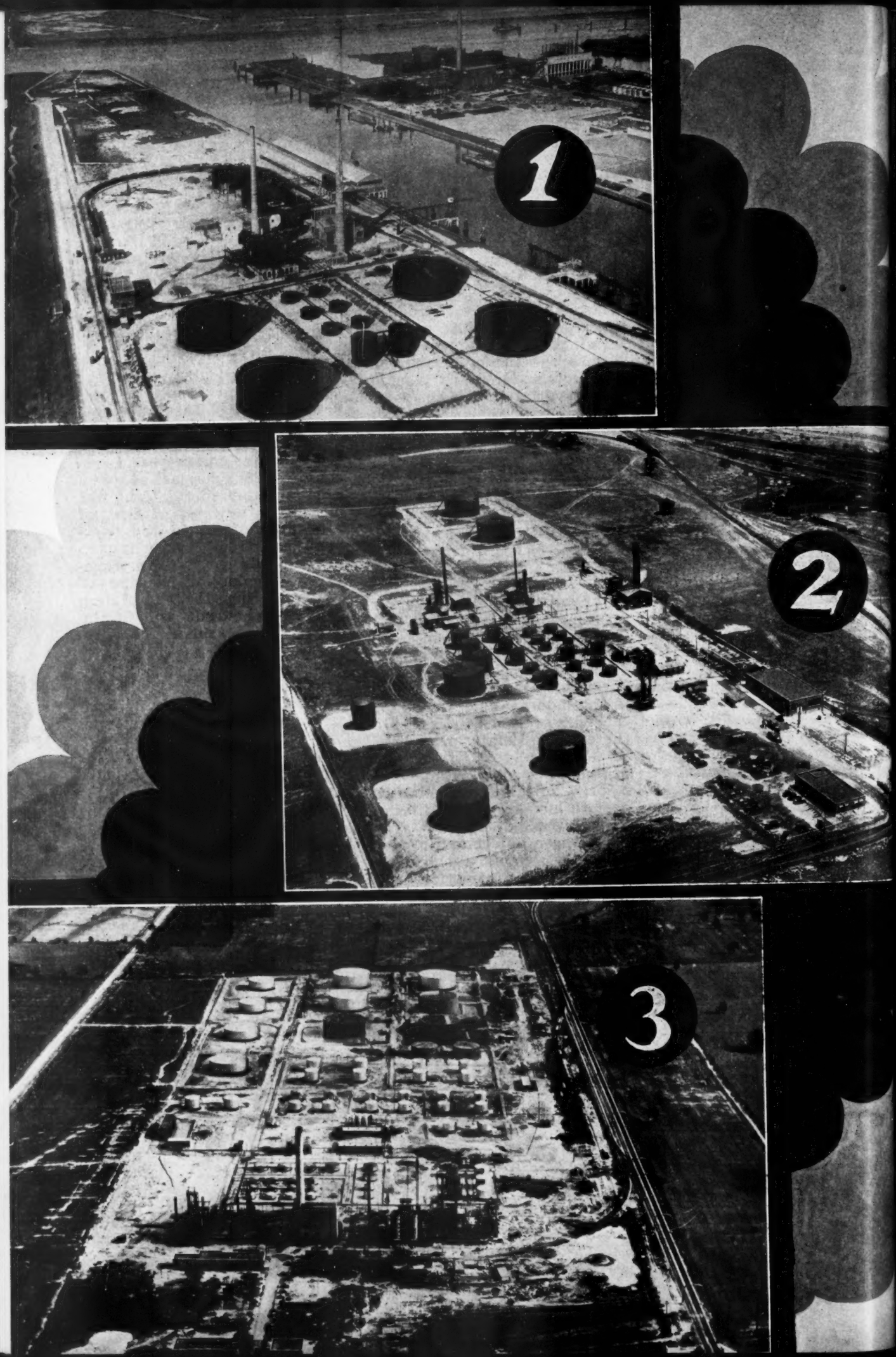
II

Effect of amount of steam used in distillation

In this particular part of the investigation, a material was used which had been subjected to six minutes contacting with acid and after neutralization had stood for one day before rerunning. The per cent of steam used in the distillation was measured in terms of c. c. of condensed water in the overhead and it is interesting to note in this case the improvement in color by the use of steam during the distillation and also the reduction in the formation of acid in the overhead.

It was not expected that there would be any change in the sulfur content and the results were as per expectation.

	a.	b.	c.
Lbs. acid / bbl.	10	10	10
Time of agitation (Min)	6	6	6
Time of settling (Min)	5	5	5
% steam in overhead	None	5%	20%
Time before rerunning	1 da	1 da	1 da
Tests on overhead—			
Gravity	54.0	54.4	54.2
I. B. P.	126	126	126
% 158	3.5	4	3.5
% 212	17.5	18	18
% 221	20.5	21	21
% 284	43.5	46	45.5
% 392	91	92	92
End Point	426	420	420
Recovery	97	97	97
Color	18	22	25
Corrosion	OK	OK	OK
Doctor	Sour	Sour	Sour
Sulphur	0.09	0.09	0.09
Acid in overhead: Grams H_2SO_4 / bbl oil	22.2	23.2	5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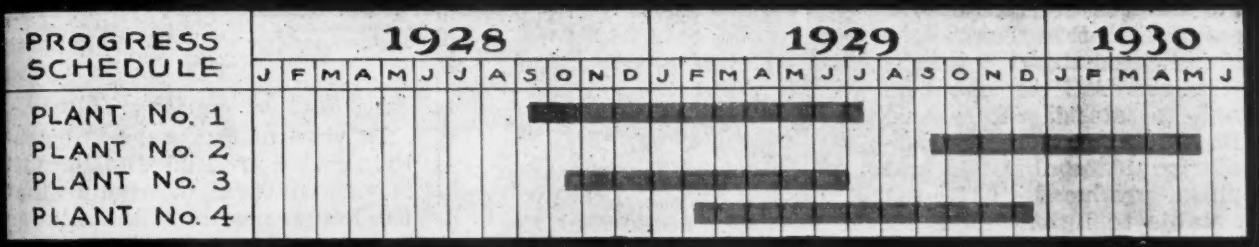

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III

Effect of Storage Time Before Rerunning

In the course of plant operations, it has been specifically noticed that at times when the amount of raw distillate on hand was so small that the treating plant and the rerun stills were running on practically freshly produced distillate, it was necessary to increase considerably the amount of acid to get a passable color on the finished gasoline and that the cost of neutralizating the rerun gasoline was considerably increased.

With this experience in view, neutralized, acid treated distillate was allowed to stand for varying lengths of time before rerunning and the results obtained indicated that the longer a neutralized distillate could be allowed to stand after acid treating and neutralizing, a better color could be obtained and a naphtha produced that was more stable to light and much more cheaply neutralized or doctor treated.

	a.	b.	c.	d.	e.	f.
Lbs. acid / bbl.	10	10	10	10	10	
Time of agitation	6	6	6	6	6	
Time of settling	5	5	5	5	5	
Time before rerunning	Rerun once	1 da	2 da	3 da	7 da	11 da
% steam used	6	6	6	6	6	6
Tests on overhead—						
Gravity	54.2	54.5	54.3	54.1	53.6	54.2
I.B.P.	128	125	126	125	124	125
% 158	3.5	4	3.5	4.5	4	3.5
% 212	17	18.5	18	17		17
% 221	20	21.5	21	20.5	20	20
% 284	45	46	44	46	45	45
% 392	93	94	93.5	92	92	92
End Point	422	420	421	424	424	420
Recovery	97.5	97.5	97.5	97.5	97.5	97.5
Color	22	23	24	24	24	25
Doctor	Sour	Sour	Sour	Sour	Sour	Sour
Sulphur	0.09	0.09	0.09	0.09	0.09	0.09
Acid in overhead:						
Grams H_2SO_4 / bbl oil	26.2	10.2	9	9.1	9.1	3.5
Corrosion	OK	OK	OK	OK	OK	OK

IV.

Effect of Water Washing

It was found that water washing had little or no effect other than to reduce the amount of caustic which was necessary to neutralize after acid treating.

	a.	b.	c.
Lbs. acid / bbl.	10	10	10
Time of agitation	5	5	5
Time of settling	5	5	5
Remarks	No water wash	½ Vol. water wash	1 Vol. water wash
Time before rerunning	1 da	1 da	1 da
% steam used	6	6	6
Tests on overhead—			
Gravity	54.0	54.5	54.0
I. B. P.	126	128	122
% 158	4	3.5	3.5
% 212	17	18	17
% 221	20.5	22	21.5
% 284	46	46.5	48
% 392	93	94	93
End Point	422	420	422
Recovery	98	98	97.5
Color	24	24	23
Corrosion	OK	OK	OK
Doctor	Sour	Sour	Sour
Sulphur	0.10	0.095	0.09
% acid in overhead—			
Grams sulphuric acid / bbl. oil	9	9	9

V.

Effect of Caustic Washing

The use of a 6 degree Baume caustic solution for neutralizing the acid treated distillate was found to give better results than a weaker solution and also that there was no advantage in washing with a solution stronger than 6 degrees Baume.

	a.	b.	c.
Lbs. acid / bbl.	10	10	10
Time of agitation	6	6	6
Time of settling	5	5	5
Neutralized with	2 Be' caustic	6 Be' caustic	14 Be' caustic
Time before rerunning	1 da	1 da	1 da
% steam in overhead	6	6	6
Tests on overhead—			
Gravity	54.1	54.3	54.3
I. B. P.	132	127	126
% 158	3	3	3.5
% 212	16	17.5	17
% 221	19.5	21	20
% 284	45.5	46.4	46
% 392	93	93	92.5
End Point	420	418	420
Recovery	97.5	97.5	97.5
Color	23	24	24
Corrosion	OK	OK	OK
Doctor	Sour	Sour	Sour
Sulphur	0.09	0.09	0.085
% acid in overhead—			
Grams sulphuric acid / bbl. oil	12	9	9

VI.

Effect of Temperature

During period of cool weather it has been noted that there is a general improvement in the color of rerun gasoline and a general tendency toward a reduction in the cost of neutralizing the rerun naphtha.

In order to substantiate the oft made claim, that treating at lower temperatures produces a better material, tests were made at temperatures ranging from 40 degrees Fahr. to 120 degrees Fahr. and it is of interest to note that up to temperatures to 80 degrees Fahr. excellent color is obtained, the production of acid in the distillate is low but that after passing 80 degrees there is a sharp decline in color and a considerable increase in the amounts of acid formed during distillation.

	a.	b.	c.	d.	e.
Lbs. acid / bbl.	10	10	10	10	10
Time of agitation	6	6	6	6	6
Time of settling	No settle	5 Min.	30 Min.	3 Hours	2 Hours
Time before rerunning	1 da	1 da	1 da	1 da	1 da
% steam used	6	6	6	6	6
Tests on overhead—					
Gravity	54.3	54.4	54.1	54.1	54
I. B. P.	127	126	128	132	122
% 158	3	3	3	3	3
% 212	17	16.5	17.5	16	17
% 221	20	20	20.5	19	20.5
% 284	45	45.5	46.5	45	46
% 392	93	92.5	93	92	93
End Point	420	421	419	424	422
Recovery	97.5	97.5	97.5	97.5	98
Color	24	24	24	22	22
Corrosion	OK	OK	OK	OK	OK
Doctor	Sour	Sour	Sour	Sour	Sour
Sulphur	.09	.09	.09	.085	.08
Acid in overhead—					
Grams sulphuric acid / bbl. oil	9	9	11	54	60.1

	a.	b.	c.	d.	e.	f.	g.
Lbs. acid / bbl.	10	10	10	10	10	10	10
Time of agitation	5	5	5	5	5	5	5
Time of settling	5	5	5	5	5	5	5
Temperature of test.	40°F.	60°F.	80°F.	100°F.	120°F.	140°F.	160°F.
Time before rerunning	1 da	1 da	1 da	1 da	1 da	1 da	1 da
% steam overhead	6	6	6	6	6	6	6
Tests on overhead—							
Gravity	53.4	53.4	53.4	54.2	54.2	54.2	54.2
I. B. P.	126	125	125	124	124	124	124
% 158	3	3	3	3	3	3	3
% 212	17	17	17	17	17	17	17
% 221	20	19.5	19.5	21	21	21	21
% 284	45.5	44	44	46	46	46	46
% 392	92	91.5	91.5	93.5	93.5	93.5	93.5
End Point	420	424	424	418	418	418	418
Recovery	97.5	97.5	97.5	97.5	97.5	97.5	97.5
Color	24	24	24	22	22	22	22
Corrosion	OK	OK	OK	OK	OK	OK	OK
Doctor	Sour	Sour	Sour	Sour	Sour	Sour	Sour
% acid in overhead—							
Grams acid / bbl. oil	5	11	47	54	60.1	60.1	60.1
Sulphur	.103	.09	.09	.085	.08	.08	.08

VII.

Effect of Settling Time

In view of the cost of neutralizing acid treated distillate, it is very natural to assume that the longer settling time allowed for the acid to disengage from the oil would be followed by smaller cost of neutralization and better results on rerunning, but such is very definitely not the case, for the longer an oil is allowed to stand in contact with acid, even though it may be a settling period, the higher is the percentage of those neutral alkyl esters formed and these upon subsequent rerunning of the distillate give higher percentage yields of sulfuric acid with a resulting naphtha of much lower color.

There is also an increase in the cost of neutralizing agent used on the overhead. The graphs attached show a very sharp loss in color when the distillate is allowed to settle for over one-half hour and a sharp increase in the amount of acid formed during the subsequent distillation and only a slight reduction in the sulfur content.

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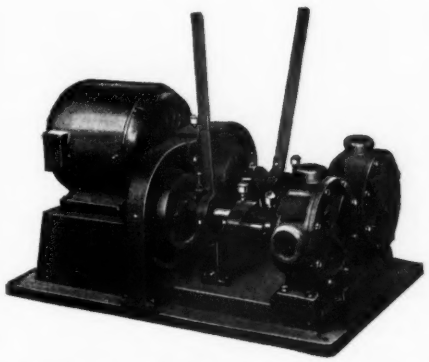

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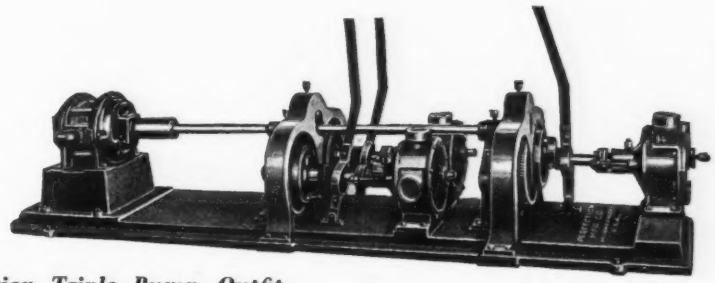

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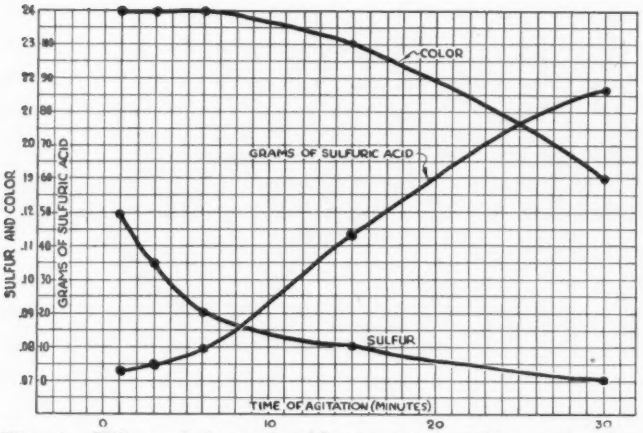


Fig. 1—Effect of time of acid contact on sulfur and color of cracked distillate

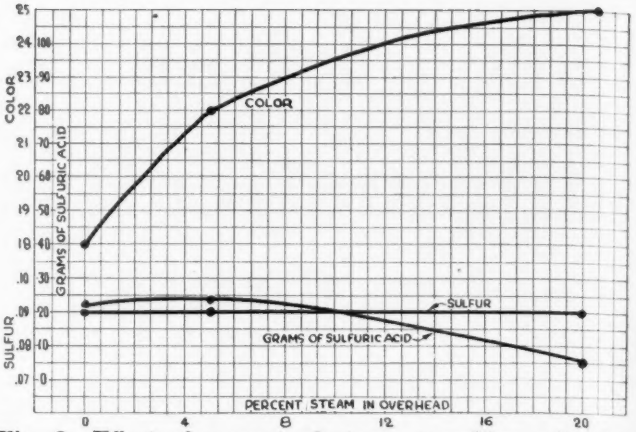


Fig. 2—Effect of amount of steam on sulfur and color in cracked distillate

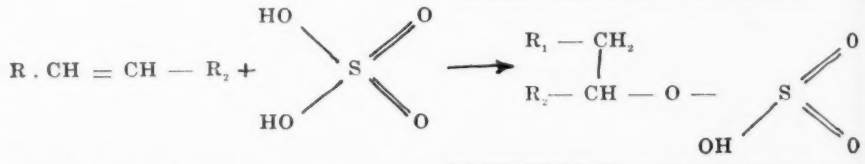
The formation of excessive acid, after long settling, led us to believe that our idea of the necessity of two acid settlers was, perhaps, wrong. Our mechanical setup being acid mix followed by two settling tanks and in order to check results as under VII, samples were taken from both our acid settlers, neutralized with caustic and immediately rerun with fire and steam, determining the per cent of acid formed in the overhead.

It is to be noted in the following tabulations, that the formation of acid in the overhead was much less from the first settler than it was from the last settler. The acid in the rerun overhead gives rise to a consistent loss of two or three points of color if the material is allowed to settle too long.

	Oil out of No. 2 Settler caustic washed Rerun, fire and steam			Oil out of No. 3 Settler caustic washed Rerun, fire and steam		
	I.	II.	III.	I.	II.	III.
% Overhead	83	83	83	83	83	83
% Steam used	6	6	6	6	6	6
Gravity	54.5	52.7	53.0	54.3	53.4	52.7
I. B. P.	114°F.	128	120	112	125	130
% 122	.5			.5		
% 158	4	2.5	4.5	4.5	3.5	3
% 212	19	15	17	18	16	16
% 221	22	17.5	20	21.5	20	18
% 284	47	41	43	47	43	42
% 392	92.5	91	89	92	90.5	91
End Point	425	425	424	422	420	420
Recovery	97.5	97.5	97.5	97.5	97.5	97.5
Color	22	22	23	20	20	20
Corrosion	OK	OK	OK	OK	OK	OK
Doctor	Sour	Sour	Sour	Sour	Sour	Sour
Sulphur % acid in overhead	.09			.09		
Grams H_2SO_4 / bbl. oil	15	17	22	29	19	26

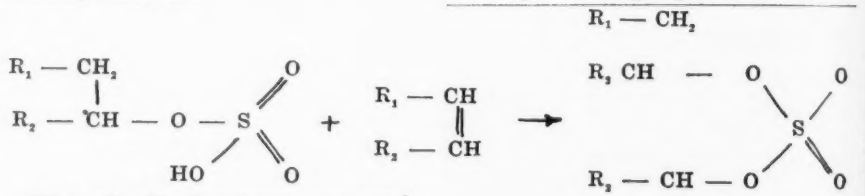
The formation of acid during the period of rerunning is largely responsible for the difficulty in producing a rerun gasoline of good color and of good color stability.

The cause of acid formation in the rerunning of acid treated distillates is sulfonation of hydrocarbons by the sulfuric acid. For instance, the olefin may react with sulfuric acid to form the mono-ester:[1]



The mono-alkyl esters are soluble in water but not soluble in petroleum distillates.

The mono-alkyl esters will react with more olefin to form di-alkyl esters:



The di-alkyl esters are soluble in petroleum distillates and are not removed by the soda treatment. When the treated distillate containing these substances is distilled they decompose with liberation of SO_2.

As would be expected, increased time of agitation, increased settling time, and increased temperature increased sulfonation. The use of wet steam in the distillation is effective in decreasing the acid formation due to the fact that the distillation temperature is lowered.

Brooks' shows that treatment of cracked distillate with a relatively small proportion of sulfuric acid tends to form di-alkyl esters which are soluble in the oil, while treatment with relatively large amounts of sulfuric acid tends to form mono-alkyl esters, which are soluble in water.

The concentration of the acid has a marked effect on the amount of sulfonation; a weak acid 85 — 90 per cent gives a markedly less amount of natural esters than does an acid of 98 — 100 per cent.[2]

Conclusions

I. Effect of time of agitation at light oil treating plant.

1. The longer the time of agitation, the greater the reduction of sulfur.

2. Too long agitation gives a poor color on the rerun gasoline.

3. The longer the agitation,

[1]Motor Fuels, Leslie, p. 400-402.

[2]Non-benzenoid Hydrocarbons Brooks, p. 106-108.

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LIFTERS

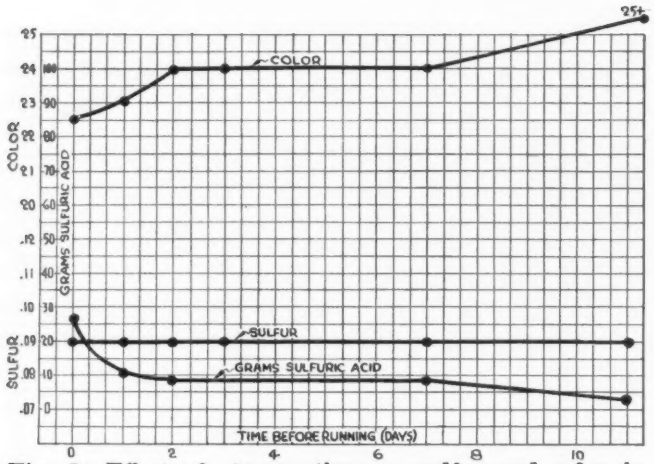


Fig. 3—Effect of storage time on sulfur and color in cracked distillate

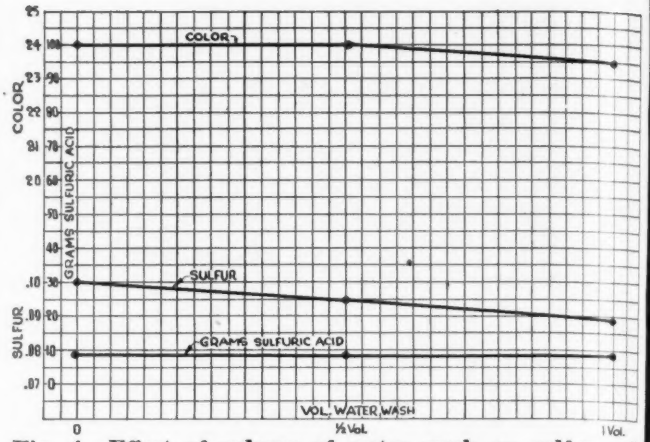


Fig. 4—Effect of volume of water wash on sulfur and color in cracked distillate

the greater the amount of acid formed at the rerun stills.

II. Effect of amount of steam used in distillation.

1. The more steam used, the better the color of the rerun overhead.

2. The amount of steam has very little effect on the sulfur content of the rerun overhead.

3. An increase in steam decreases the amount of acid formation at the rerun stills.

III. Effect of storage time before rerunning.

1. A storage time of one day or more before rerunning improves the color on the rerun gasoline.

2. The sulfur content is not affected by storage.

3. Storage time before rerunning reduces considerably the formation of acid at the rerun stills.

IV. Effect of water wash at light oil treating plant.

1. A water wash before caustic neutralization at light oil treating plant does not affect the acid formation at the rerun stills.

2. A water wash lowers the sulfur content slightly on the rerun gasoline.

3. A water wash does not affect the color of the rerun gasoline.

V. Effect of caustic wash at light oil treating plant.

1. A caustic strength higher than 2 Be′ is preferable. However, any strength above 4 Be′ will give the same results at the rerun stills on sulfur, color and acid formation.

VI. Effect of temperature of treat at light oil treating plant.

1. A low temperature treatment gives better color than a high temperature treatment.

2. The acid formation at the rerun stills is markedly less on the distillate treated at a low temperature than on the distillate treated at a high temperature.

3. The sulfur is slightly lower on the distillate treated at a high temperature.

VIII. Effect of settling time at light oil treating plant.

1. Settling time before caustic neutralization at light oil treating plant markedly increases the acid formation at the rerun stills.

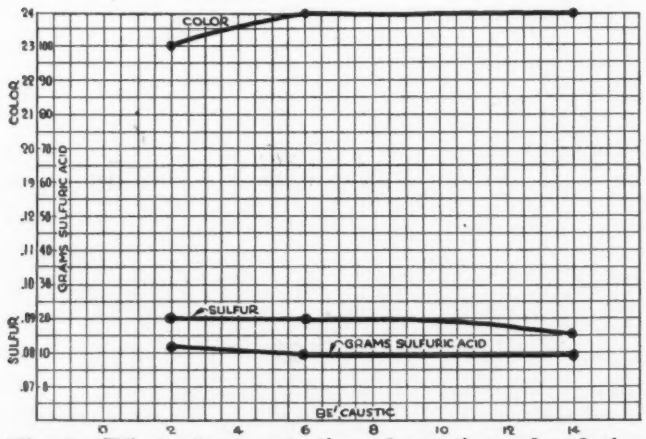


Fig. 5—Effect of concentration of caustic wash solution on sulfur and color in cracked distillate

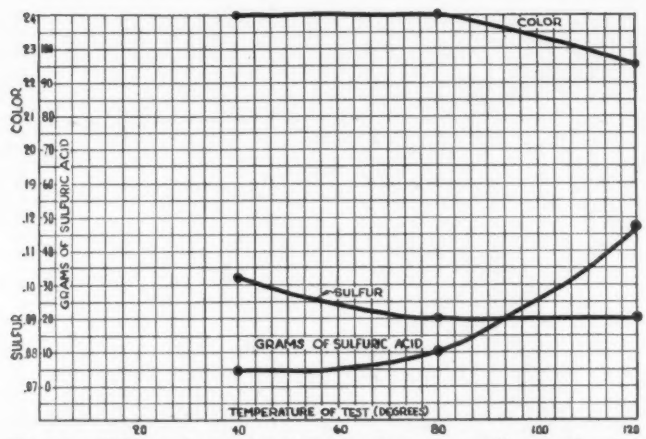


Fig. 6—Effect of treating temperature on sulfur and color in cracked distillate

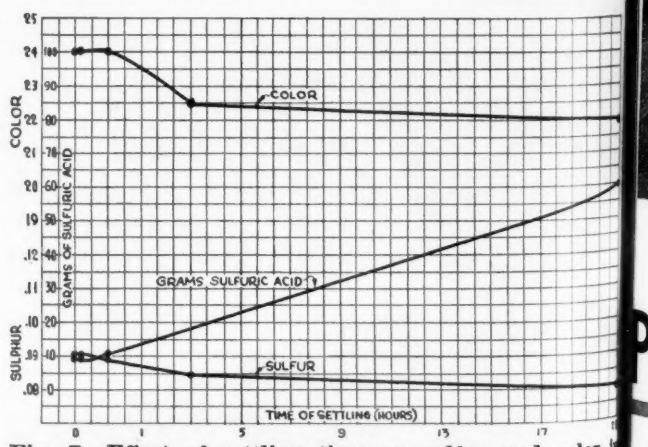
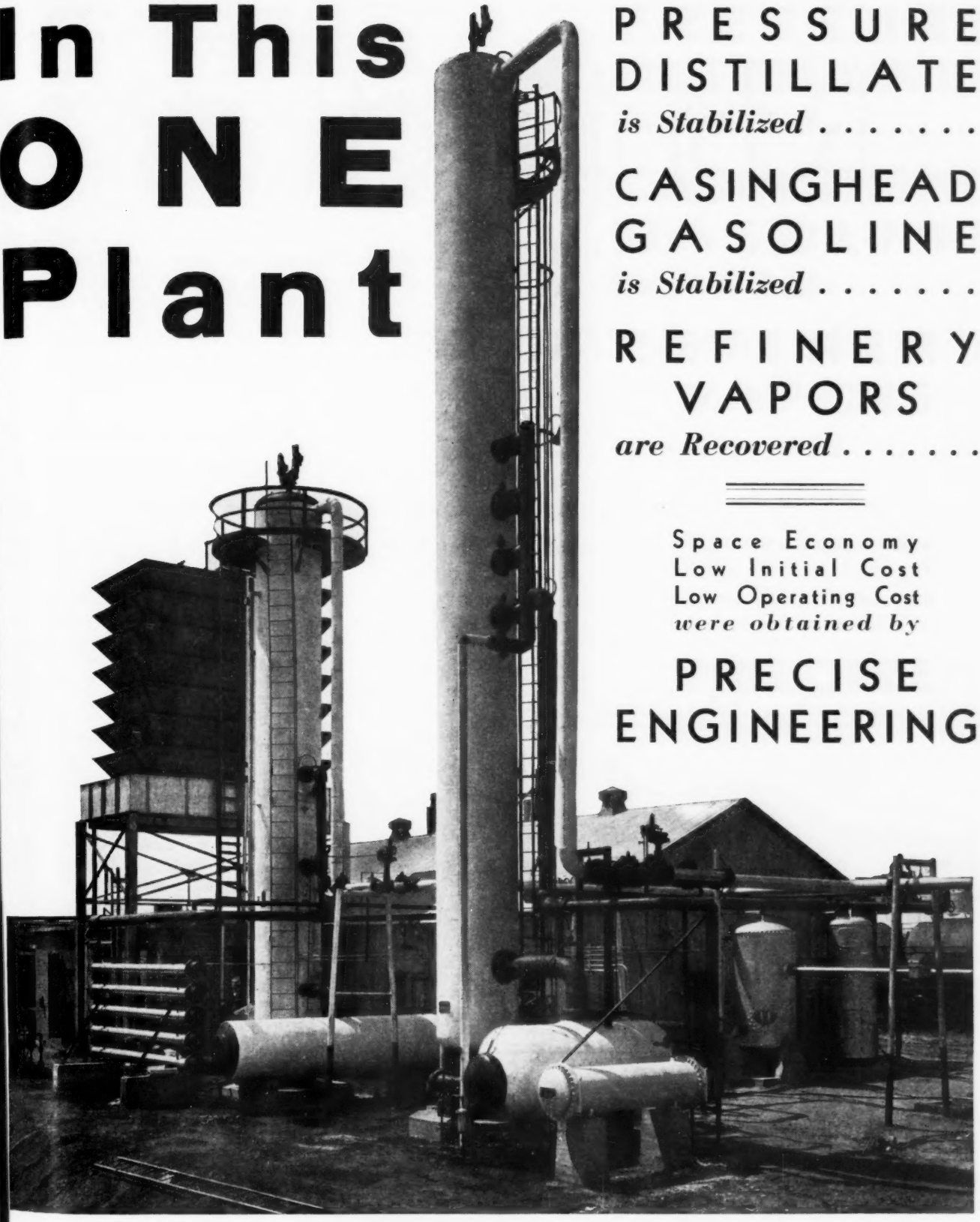


Fig. 7—Effect of settling time on sulfur and color in cracked distillate

In This ONE Plant



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2. Prolonged settling time tends to affect the color on the rerun overhead.

3. Prolonged settling time lowers the sulfur slightly on the rerun gasoline.

On the basis of our findings from this investigation, our plant operations have been revised with the result that consistently better color is obtained, the rerun material is considerably more stable to light, the cost of neutralization has been materially lessened and the wear and the tear of our equipment, due to acid formation, has been cut down to an absolute minimum.

NEW EQUIPMENT

Oxweld Acetylene Co., 205 East 42nd St., New York, N. Y., has developed two small capacity manifolds for smaller users of oxygen and acetylene, particularly for welding schools and aircraft schools. These are designed for use where a number of welding stations are necessary and where the consumption of gases is not large enough to warrant an acetylene generator and large oxygen manifold.

One is a six-cylinder oxygen manifold and the other a four-cylinder acetylene manifold. In the oxygen manifold three cylinders may be changed while the bank of three on the other side is maintaining the supply of oxygen. In the acetylene manifold, one, two, three or four cylinders may be used simultaneously so that a cylinder may be replaced without shutting off the acetylene supply.

Neville Chemical Co., Pittsburgh, announces a reduction of three cents per pound in the retail price of Nevindene Resin. This resin, formerly called Indur, it is understood, is a condensation product, of 155 C. melting point, and has been employed with advantageous results in acid and alkali resistant varnishes, aluminum, concrete and floor paints, gilsonite and insulating varnishes, and several other types of coverings of interest to the oil industry.

Interlocked Distillation Controls Are Development of Trend-Analysis

By A. E. Krogh* and H. Barnett*

THE demand for improved methods of automatic control of temperature, pressures, flow, level, etc., in the oil industry has been so insistent that instrument manufacturers have been hard pressed to keep up with it. Progress has been especially rapid in temperature control, and progressive instrument manufacturers have availed themselves of the opportunity for growing with the industry.

Automatic temperature control presents complex problems for several reasons. First, because a large time lag is usually present. By this is meant, that a considerable period of time intervenes between the moment that a change in the controlling quantity is made, and the moment that the result of this change can be detected by a measuring instrument. Secondly, thermocouples for measuring temperatures in refinery processes must be used in order to secure the sensitivity and quick response required by the process, but thermocouples do not develop very much power and it is not feasible to drive any type of valve directly from the current developed by them. Hence, it is required that sensitive millivoltmeters or potentiometers be used to supply this power through suitable relay governing devices.

*Engineering Development Dept., The Brown Instrument Co.

Early applications of automatic control made use of what now appears to be rather crude equipment, and only a laborious development has led to the refinement now available in the trend analyzing type of controls. The trend analyzing system of control is now quite well known throughout the industry. In this type of control, regulation of temperature, flow, or pressure is obtained in accordance with several factors which in-

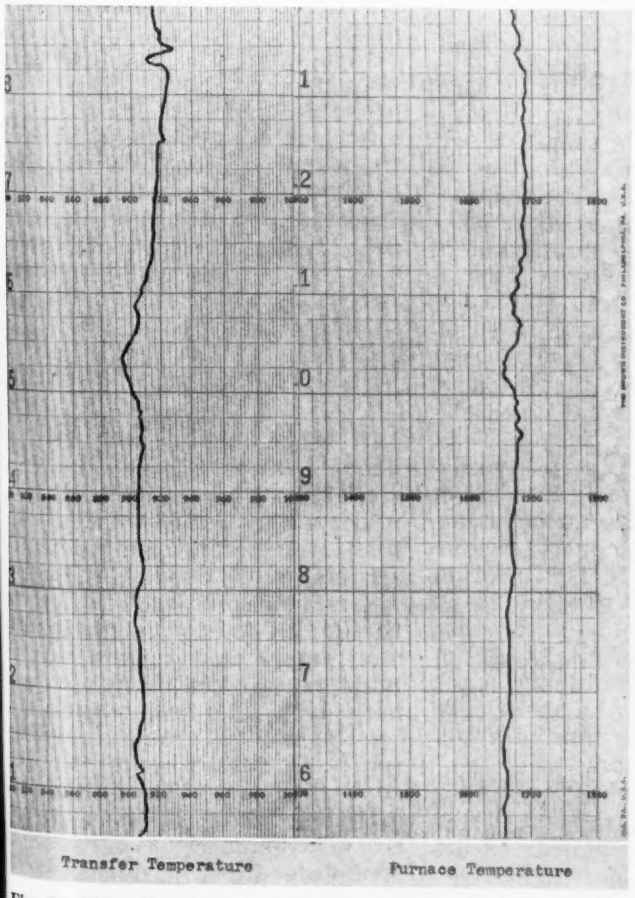

Fig. 1—This Represents A Good Average Record Of The Transfer Temperature And The Furnace Temperature When Fuel To Furnace Is Controlled By Hand

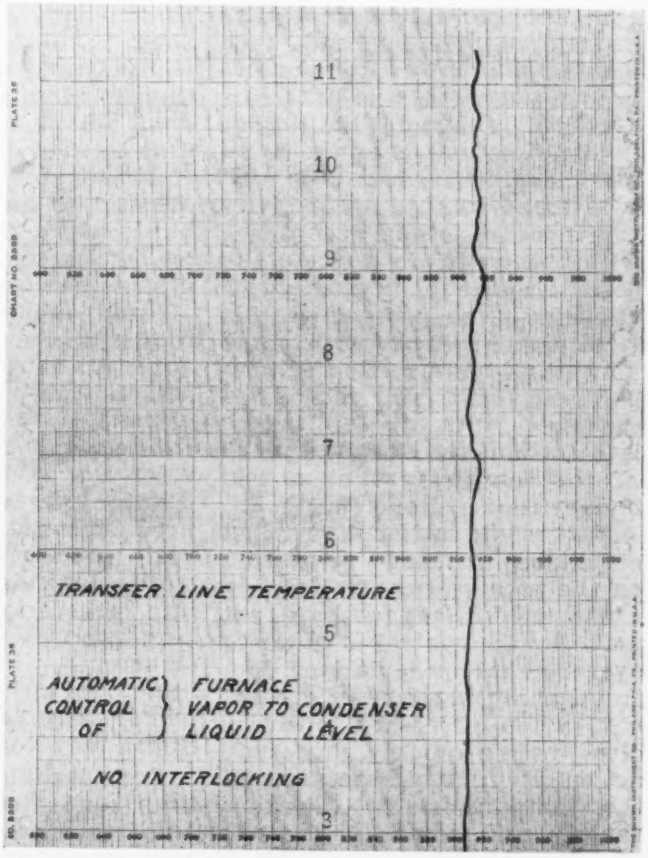

Fig. 2—Showing The Transfer Temperature When The Unit Was Operating With Independent Control Devices On Furnace Temperature, Transfer Temperature And Liquid Level

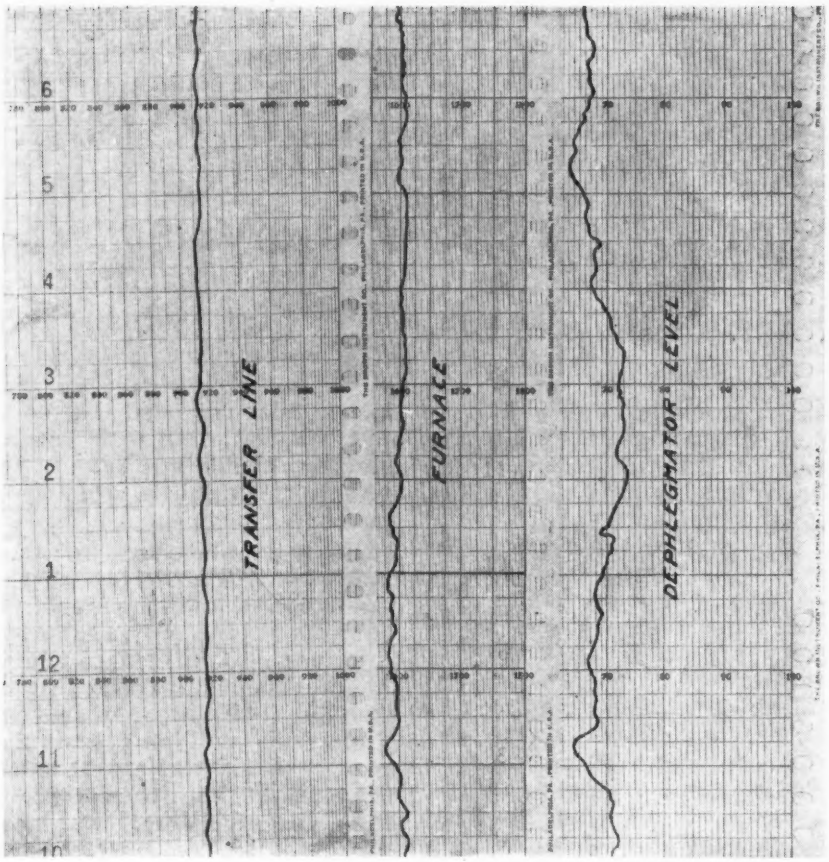

Fig. 3—Three Records Taken From Separate Instruments Operating Under Interlock System. These Records Illustrate The Simultaneous Changes Taking Place at The Same Time On the Same Unit Under This System

telligent operators have always considered. It has not been possible, heretofore, to take into account some of these factors because of certain limitations in the functioning of the automatic control devices.

A trend analyzing temperature control acts in accordance with the trend, as well as the position of the temperature with respect to the control setting. It recognizes the rate of change as well as the direction of temperature trend, and acts in accordance with these, taking into account the absolute value of the temperature as a secondary though important point.

The result is that a marked stabilizing influence is exerted on the processes controlled, because sudden changes are not made by the control in order to overcome minor deviations. The trend analyzing type of control can, when necessary, open or close valves quickly, but such action is produced only when the temperature is changing rapidly and when the nature of the change is such that the temperature might tend to deviate from the control setting for an appreciable period of time.

The trend analyzing control therefore represents an achievement which is the result of several years of development work. It is probably not the ultimate answer to automatic control, but is such a great improvement on former systems that its success is assured and has been already demonstrated. Progress in automatic control must not stop, however, just because a trend analyzer has been developed.

The next logical step is to develop a system such that more than one variable can be measured and used to control a complete process. It is, in other words, logical to proceed to an interlocked system such that two or more trend analyzing instruments will influence each other, and adjust the position of one or more valves as the application may demand.

Considerable field work has been conducted along this line and it has been possible to develop a system in which three trend analyzing controls have been interconnected in order to produce the final result desired. In this system, three instruments are used to measure three different but interdependent variables. Two of these instruments prepare an electrical circuit for the automatic control of a valve by the third instrument. It is possible for any one of the other two instruments to regulate another valve independently of the interlock, if so desired. The system may be described by stating that the two master instruments signal to the third instrument what the conditions are at the points where the respective measuring mediums are located.

This action, it may be recognized, is similar to the action secured in a refinery, where intelligent operators inform one another as to what steps are being taken. For instance, one man is seldom instructed to maintain a constant furnace temperature and a constant hot oil temperature, while another man is told to hold a constant flow. Manifestly, it is impossible to maintain such a rigid control on the system.

If the flow and hot oil temperature must be held constant, then the furnace must be allowed to vary. If, on the other hand, the furnace temperature and the hot oil temperature must be held constant, the flow must be permitted to vary. This is what the trend analyzing interlocked system will do. Two factors may be definitely set at a given point, and the system will then automatically vary the third factor in order to maintain the two fixed factors.

The best method of describing this type of control system will be to outline a system of automatic control installed on a well-known type of still in a midwestern refinery. In this plant four trend analyzing instruments are used. One instrument controls the reflex to the dephlegmator. This instrument operates independently to maintain a constant vapor temperature. The results obtained by the use of trend analyzing types of instruments for the control of top-of-tower temperatures with old systems of control equipment were largely responsible for the development of the trend analyzer.

A second trend analyzing in-

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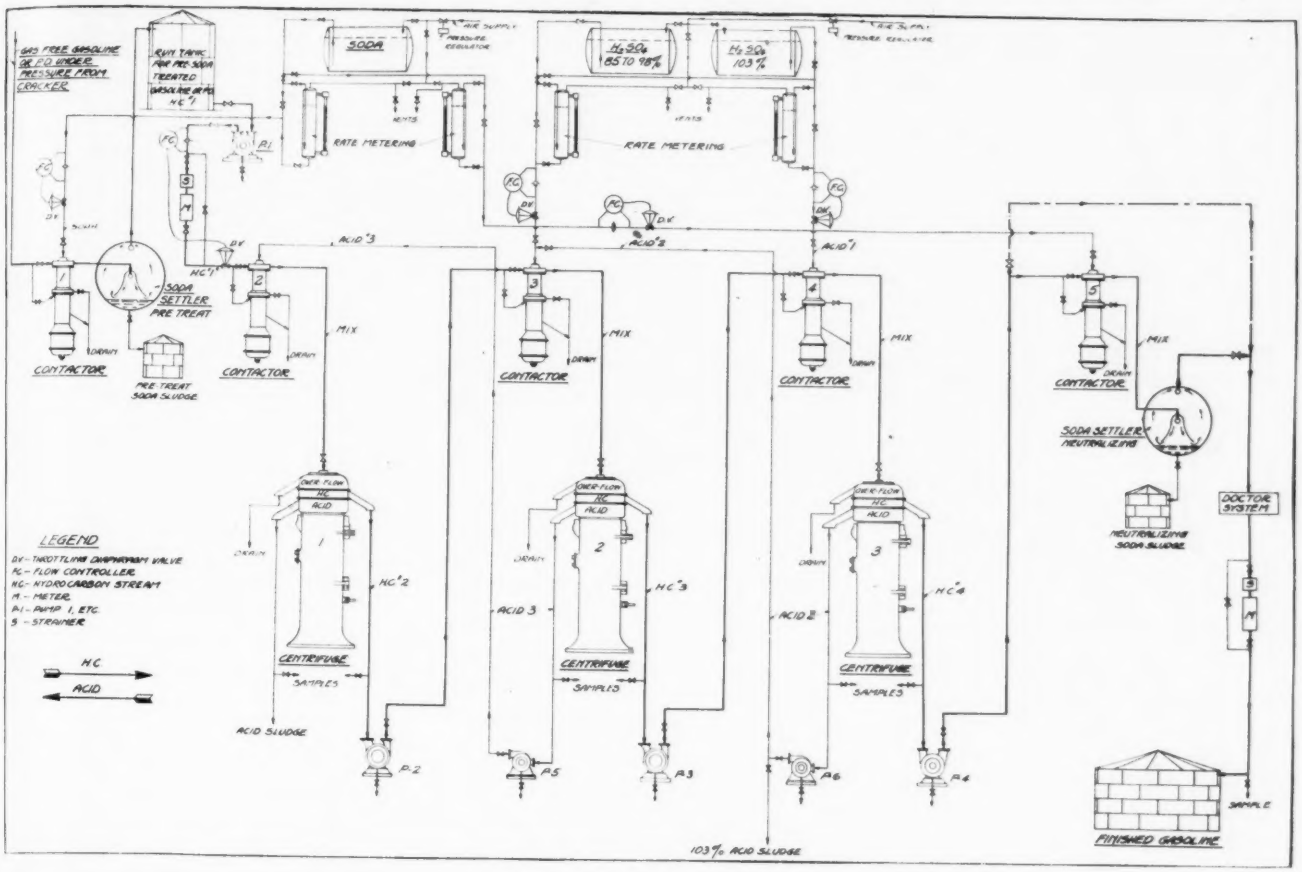
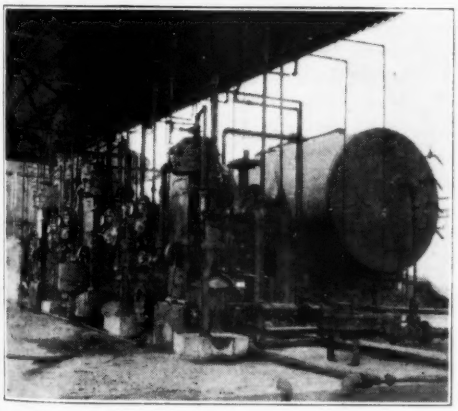


TYPICAL FLOW SHEET



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strument measures the hot oil temperature as the oil reaches the furnace.

A third instrument measures the level in the dephlegmator and controls the flow through the tubes in accordance with this level by regulating the steam valve to the hot oil pump. In other types of units this instrument would be replaced by one measuring and controlling the flow directly.

A fourth instrument measures the average of two temperatures in the furnace. One thermocouple is inserted over the bridge wall on each side of the furnace, and control is secured from the average of these temperatures. This instrument, however, does not have a definite control point.

The hot oil temperature instrument, the level controlling instrument and the furnace controlling instrument are electrically interconnected in order to secure a trend analyzing interlock control. It is obvious to a refinery operator that if in the normal course of events the hot oil temperature falls, there are two possible remedies. He may increase the furnace temperature or he may decrease the throughput. If the throughput must be maintained constant, he can vary only the furnace temperature, but if the furnace temperature should be as high as desirable, he would be forced to reduce the throughput. In the system described, the flow and the hot oil temperature were fixed and the furnace temperature was automatically varied. There is no reason why the system could not have been applied to vary the throughput while maintaining a constant furnace temperature.

The interlocked trend analyzing system in this case permits the flow to vary as it will in order to maintain the desired level.

If now an operator observes that the hot oil temperature is dropping and proceeds to increase the furnace temperature by increasing the fuel supply, he will obtain the desired increase in hot oil temperature. If, simultaneously, another man observes the low hot oil temperature and reduces the throughput, the effect of the two changes will be to increase the hot oil temperature much more than is desired, and the two correcting forces, while each is entirely logical and right, will interfere and prevent successful operation of the still.

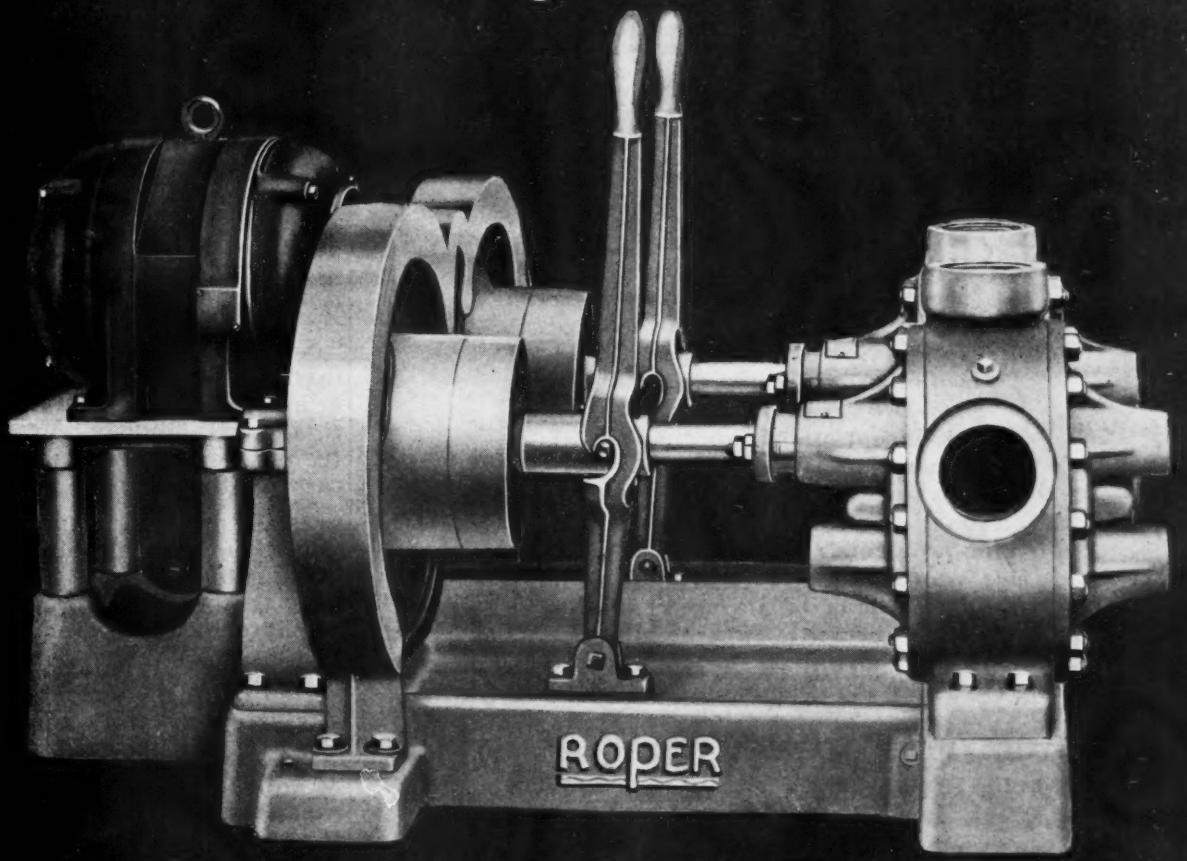
In the interlocked system, signals are transmitted from one instrument to the other, so that if the transfer line temperature tends to decrease, the furnace temperature is automatically caused to increase,but the increase desired will depend upon the behavior of the level in the dephlegmator, and hence upon the flow. If, for instance, the level were rising in the dephlegmator at the time the transfer line temperature were falling, the increase in flow, which would result from the rise in level and consequent speeding up of the hot oil pump, would tend to drop the hot oil temperature still further, and it would therefore become imperative that the furnace temperature be raised comparatively quickly.

On the other hand, if the flow were actually decreasing, due to a falling level, it would be a bad mistake to increase the temperature of the furnace rapidly, because a decrease in flow would automatically tend to increase the hot oil temperature. If, however, the flow were constant, then the furnace temperature should be and would be increased at what we may term a "moderate" rate.

Similarly, if the transfer line temperature should tend to rise, and the level should simultaneously tend to decrease, we would have cause for reducing the temperature of the furnace, rather suddenly. It is, of course, understood that the furnace temperature must not be dropped or raised at an excessive rate. The terms rapid, moderate and slow, when used here refer only to relative rates of change. A slow decrease in furnace temperature would be required if the level were rising (with a consequent flow in-

Hot Oil Temperature	Dephlegmator Level (Flow)	Automatic Correction Applied by Interlock Control System
Correct & Stationary	Stationary	None
	Decreasing	Decrease flow slightly & lower furnace temperature at moderate rate
	Increasing	Increase flow slightly & raise furnace temperature at moderate rate
Correct & Falling	Stationary	Raise furnace temperature slowly
	Decreasing	Decrease flow slightly & raise furnace temperature slowly
	Increasing	Increase flow slightly & raise furnace temperature rapidly
Correct & Rising	Stationary	Lower furnace temperature slowly
	Decreasing	Decrease flow slightly & lower furnace temperature rapidly
	Increasing	Increase flow slightly & lower furnace temperature slowly
Low & Stationary	Stationary	Raise furnace temperature at moderate rate
	Decreasing	Decrease flow slightly & raise furnace temperature slowly
	Increasing	Increase flow slightly & raise furnace temperature rapidly
Low & Falling	Stationary	Raise furnace temperature at moderate rate
	Decreasing	Decrease flow slightly & raise furnace temperature slowly
	Increasing	Increase flow slightly & raise furnace temperature rapidly
Low & Rising	Stationary	Raise furnace temperature slowly
	Decreasing	Decrease flow slightly & raise furnace temperature slowly
	Increasing	Increase flow slightly & raise furnace temperature rapidly
High & Stationary	Stationary	Lower furnace temperature at moderate rate
	Decreasing	Decrease flow slightly & lower furnace temperature rapidly
	Increasing	Increase flow slightly & lower furnace temperature slowly
High & Falling	Stationary	Lower furnace temperature at moderate rate
	Decreasing	Decrease flow slightly & lower furnace temperature rapidly
	Increasing	Increase flow slightly & lower furnace temperature slowly
High & Rising	Stationary	Lower furnace temperature at moderate rate
	Decreasing	Decrease flow slightly & lower furnace temperature rapidly
	Increasing	Increase flow slightly & lower furnace temperature rapidly

ROPER



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crease) at the same time that the hot oil temperature showed signs of falling.

We may go a step further by declining to wait for a deviation in hot oil temperature. When the level changes we know that there is going to be a change in the throughput of hot oil and consequently we know that there is going to be, or at least is extremely likely to be, a resultant deviation in hot oil temperature. There is therefore no logical reason for waiting for such a change. We may proceed to take steps to prevent it, and perchance it may then never appear. Therefore, when the level in the dephlegmator drops and the pump consequently slows down, the control system automatically lowers the furnace temperature somewhat to compensate for this decrease in flow. Similarly, if the flow is changing in the other direction, it will slightly increase the furnace temperature to compensate for the increase in flow.

If the hot oil temperature is not at the control point, a moderate rate of change in the furnace temperature is effected by the interlocked system.

A concise tabulation of the action of this interlocked trend analyzing system is appended.

As will be seen from a glance at this table, the control operates in a very logical manner. It is therefore not surprising to observe the excellent results which have been secured from this equipment.

Chart 1 illustrates the type of records secured when the unit was under hand control.

Chart 2 shows the transfer temperature when the unit was controlled under independently functioning devices.

Chart 3 shows the type of operation secured with the interlocked trend analyzing control.

It is fully realized that various types of stills will require different systems of interlocked control, but a definite beginning has been made and the results have been fully promising enough to warrant additional work along this line. It is believed that the industry, as a whole, will be interested in the development and additional articles which will be published from time to time.

A car tank built of aluminum sheet for bulk chemical transportation

Uses of Aluminum Growing In Oil Industry

By E. B. Svenson*

WITH millions of aluminum pistons in engines powered with gasoline and oil-lubricated, it is appropriate that aluminum is becoming a familiar metal to those who produce and refine petroleum. One of the earliest uses for the metal, which was as a pigment for paint, has become the most extensive, but the development of strong aluminum alloys and various advancements in fabricating technique have brought other aluminum products into use by petroleum producers and refiners.

One of the newest of these applications is the employment of aluminum foil either as a heat reflecting covering or as a protective coating to shield against corrosion. Tanks and other containers for crude oil high in sulfur compounds are thus protected on the inside with a layer of aluminum foil, and gasoline containers are similarly lined not only to shield the underlying metal from rusting but to avoid the resultant discoloration of the product. Newly coated pipelines are wrapped with aluminum foil as a mechanical protection against the action of soil stress and subsequent corrosion.

Aluminum sheet and structural shapes for tanks handling sour crude oil show a favorable resistance to corrosion, and the metal is used in a variety of wrought or cast forms in refinery equipment. Strong aluminum alloys are incorporated in oil transportation units to save dead-weight and thereby to allow increased payloads with substantial benefits.

These various uses are based on favorable chemical and physical properties of the metal. It is the writer's intention to comment upon these advantageous properties as they have been demonstrated in use.

Aluminum Paint

Aluminum bronze powder for use as a paint pigment is composed of very small and exceedingly thin flakes of pure aluminum. When aluminum bronze powder has been stirred into a suitable vehicle, such as kettle-bodied linseed oil or spar varnish, the tiny metallic flakes form a mirror-like, almost continuous surface film of metal.

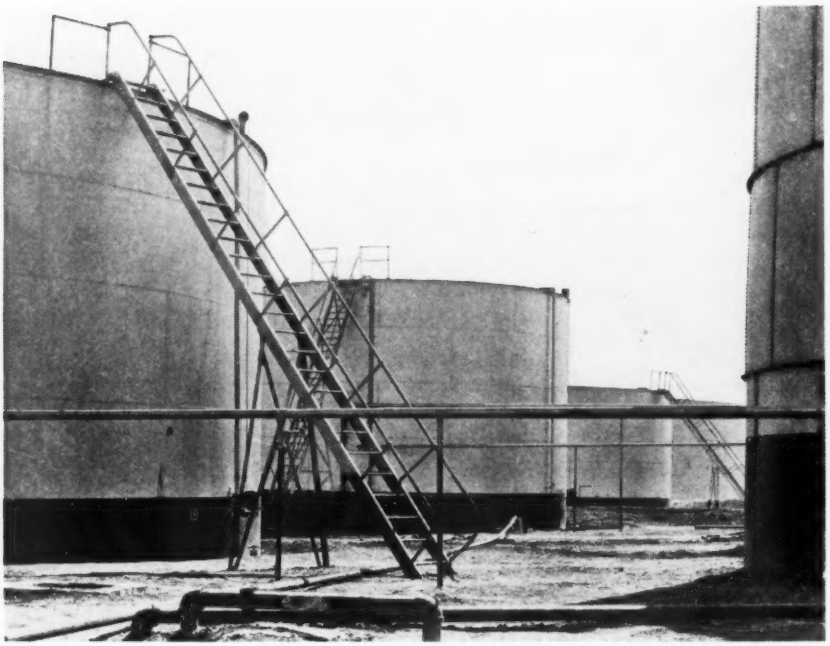
*Engineer, Aluminum Co. of America.

Upon this "leafing" process depends many of the characteristic properties of aluminum paint. Not only do the metallic flakes render the paint highly moisture proof, but they reflect light and radiant heat to a marked degree. This reflectivity serves the double purpose of insulating the painted object, and of shielding the paint vehicle from the harmful action of actinic light. Because it is the vehicle and not the pigment that fails in a paint film, it is important to the life of the coating that the vehicle be protected.

When aluminum paint is mixed in the recommended proportions (two pounds of aluminum bronze powder per gallon of vehicle), and properly applied, the paint film should contain four or five layers of metallic flakes so that even if the top layer should weather away there are successive layers beneath to provide the necessary protection.

The properties of aluminum paint which recommend themselves to the oil industry are:

Opacity
High Reflectivity



One coat over a black primer gives the characteristic silvery appearance of aluminum paint; a second coat of aluminum is recommended for out-door work

Moisture Resistance
Resistance to Industrial Fumes and Gases
Durability
Cleanliness
Discoloration Resistance

Opacity

Although the reasons for the opacity of aluminum paint are described in the preceding paragraphs, the extent is well illustrated by Table I which gives the percentage of white light transmitted through a paint film according to the methods of A. H. Taylor (Bureau of Standards, Sci. paper 405, November 30, 1920.)

aluminum paint is its high reflectivity for light and also heat. Aluminum paint in practice reflects from 60 to 65 per cent of the light incident upon it and a larger proportion of the radiant heat. This is highly important in the painting of oil storage tanks. This value has been effectively demonstrated by means of tests made by the Bureau of Mines[1] on four 55,000-barrel storage tanks.

Table II gives these results obtained on Burbank Crude containing 29 per cent gasoline and naphtha pumped from vapor tight lease tanks.

Table I

Kind of Paint	Light Transmission One Coat percent	Two Coats percent	Three Coats percent
Commercial titanox paint	17.7	5.8	2.4
White lead-zinc oxide paint	26.2	16.3	
Aluminum paint (varnish vehicle)	0.25	0.25	

Besides the protection feature, the opacity serves another purpose in that a single coat will effectively hide any underlying color, even black. For interior work in renewing dingy rooms, one coat will do the work as effectively as two or three coats of white or other light colored paints. For outside work it is advisable to use two or three coats for the increased protection.

Reflectivity

Closely connected with the low transmission factor of

The saving in oil affected is obvious and particularly that of the more valuable lighter fractions.

Moisture Resistance

Steel cannot rust nor wood decay if moisture does not penetrate the paint film to the underlying surface. Aluminum paint has a very high rating for moisture resistance. This was first demonstrated by the Forest Products Service of the U. S. Department of Agriculture at its laboratory at Madison, Wis.[2]

Table III gives these results.

Table III

Coatings	Moisture-Proofing Efficiency, Percent
Aluminum leaf process, asphalt paint base	98
Pitch paint plus aluminum powder	98
Spar varnish plus aluminum powder	94
Bronzing liquid plus aluminum powder	93
Asphalt paint	90
Spar varnish	57
Linseed oil	17
Bronzing liquid	11

Such moisture resistance is certainly a factor with materials continuously exposed to the weather or tanks which must be water cooled.

Resistance to Industrial Fumes & Gases

A large number of practical as well as laboratory tests indicate that aluminum is very little affected by industrial fumes. Aluminum paint using metallic aluminum for the pigment is also quite resistant to these fumes as attested by numerous applications in industrial centers and in the oil fields.

Steel panels coated with aluminum paint and exposed at New Kensington, Pa., in an industrial community burning soft coal have been given almost perfect protection for five to seven years. Similar applications in connection with oil equipment wherein the destructive fumes are compounds of sulfur have given practical demonstrations of this resistance.

Durability

Many tests have been made by the Institute of Paint and Varnish Research, the United States Bureau of Standards, and aluminum research laboratories of the Aluminum Co. of America, which indicate how well aluminum paint withstands ex-

[1]Schmidt, Ludwig, Effect of Tank Colors on Evaporation Losses of Crude Oil, U. S. Bureau of Mines Report Serial No. 2677—1925.

[2]Forest Products Service, Technical Note 181, January, 1923; Dunlap, M. E. —Ind. Eng. Chem. 18 1230—1926.

Table II

Color of Tank	Initial Gage barrels	Evaporation loss in 1 year, bbl.	Loss in Gravity in 1 year A.P.I. degrees
Black	52,058	649	0.6
Red	53,294	609	0.5
Gray	53,192	547	0.3
Aluminum	53,418	447	0.2

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A test of aluminum foil on the interior of a lease tank handling high sulfide West Texas crude

posure for three to seven-year periods in a variety of weather conditions. Innumerable applications have given practical service, and may be seen on every hand throughout all sections of the country.

The other properties that make aluminum paint desirable are: (1) ease of application (it can be applied by brushing, spraying or dipping); (2) availability (practically all paint manufacturers make vehicles satisfactory for use with aluminum bronze powder and can furnish the powder); (3) cleanliness (paints which have a minimum amount of oil in the surface, i. e., dull or aluminum paints, hold dust less readily than paints high in oil, i. e., gloss), and (4) resistance to discoloration (aluminum paint prevents bleeding through of redwood, cedar and mahogany stains and black organic paint compounds such as asphalt.)

Foiling

It is a natural sequence of thought that if a metallic paint with an infinite number of metallic flakes in the metallic coat can render excellent service, a continuous metallic sheath could render even better protection. This thought prompted the initiation of various tests in the Texas oil fields and the results have indicated that the application of aluminum foil by means of suitable adhesives is a practical economy in many cases.

Aluminum foil has the same characteristics as aluminum paint but even more marked in degree, as far as reflectivity, moisture proofing and cleanliness are concerned.

The reflectivity of aluminum foil for white light is 86 per cent while for heat rays it is much higher. The Forest Products Laboratories in tests quoted above, in Table III, find that foil applied with asphalt gives almost perfect moisture proofing.

Because the foils used in this type of work are comparatively thick, ranging from .001 inch to .005 inch thick, coatings made with them are much tougher than a paint film. Possessing an exceedingly smooth brilliant surface, the foil offers little foothold for dirt and thus tends to keep comparatively clean. When rainstorms occur, Nature scrubs the easily cleaned foil surface. The durability of this type of coating has not as yet been directly determined due to the fact that the earliest applications, which are less than two years old, are still in excellent condition.

Costs for "foiling" are a little greater than for painting due to the higher cost of the materials, but will probably be compensated for in greater advantages and service. These advantages can best be illustrated by a study of Table IV which gives the results of a comparative test of five oil storage tanks at Wink, Texas. These results are taken from a paper presented before the American Petroleum Institute, Chicago, December 5, 1929, by Mr. Stanley Gill, research department, Gulf Oil Co., Houston.

Temperature readings listed below and taken on July 15, 1929, were typical of any hot day during the summer:

It will be noted that the difference between the maximum and minimum temperatures for the aluminum foiled tank is less than half the same temperature change for the unpainted tank and only two-

Table IV

Comparative Temperature and Evaporation Data on Storage Tanks at Wink, Texas

Temperature readings listed below and taken on July 15, 1929, were typical of any hot day during the summer:

		Tank Top Temp. °F.	Vapor Space Temp. °F.	Oil at One Ft. Level °F.	Bbl. lost by Evaporation 90 Days
Unpainted Tank	High	156	127	106	
	Low	76	83	91	375
	Total Chg.	80	44	15	
Aluminum Painted Tank	High	121	111	97	
	Low	77	82	83	240
	Total Chg.	44	29	14	
Aluminum Painted Shell, Insulated Roof	High	106	102	94	
	Low	85	86	90	140
	Total Chg.	21	16	4	
Aluminum Foiled Roof, Aluminum Painted Shell	High	112	105	95	
	Low	80	83	88	81
	Total Chg.	32	22	7	

thirds as much as for painted tanks without insulation. This temperature reduction over a four and one-half month period resulted in a saving of 320 barrels of gasoline and naptha—the material saved would, of course, be the low boiling or valuable fractions of the crude oil.

A number of others large producers and refiners have made applications of foil to storage tanks and are securing favorable results. Other applications where aluminum foil is being tried out are:—

1. Reflective and protective coatings for tank cars.
2. Protective coatings for the undersides of roofs and top rings of tanks handling high sulphide oils.
3. Protective coatings for interiors of lease tanks handling oil, water or gas of a corrosive nature.
4. Pipeline coatings to shield paint coatings against soil stress effects.

Tank Cars

Aluminum foil presents easy applicability and long life as its first advantages over built-up insulation for tank cars. It is equally effective in preventing evaporation losses and in addition possesses good appearance and resistance to soiling. The brilliant smooth surface does not hold dirt or smoke as do ordinary paint surfaces and dirt accumulated on oil spillage can be easily and completely removed.

Tank Interiors

Aluminum is resistant to hydrogen sulfide and other sulfur compounds which occur in the sour crudes of West Texas. A coating of aluminum foil applied to roof and top ring has provided excellent protection against gases in lease tanks for a much longer period than any other available coating.

This development was delayed somewhat due to the lack of suitable adhesives insoluble in oil and gasoline. Recently some very good adhesives with "bakelite" base have been developed which seem adequate.

Flow tanks containing oil and water in the West Texas area where tank corrosion is severe have been given good protection by coating with aluminum foil. The more recent procedure is to foil the insides of the sheets before the tank is erected.

Pipeline Coating

Another interesting application of aluminum foil which is of considerable importance is the application to buried pipelines for protection against corrosion. There are many coatings which are not affected chemically by the soils with which they are in contact. However the soil in settling pulls this coating from the pipe which then is exposed to the chemical corrosion of the soil.

Aluminum foil when properly stuck to a good pipe coating prevents the action of this soil stress and protects the coating. This is valuable even if the foil only lasts for the period of settling, however in most soils the foil does have a much longer life.

This development indicates so much promise that it has been included by the American Petroleum Institute in the 18 products which it will have tested for pipe coating service by the Bureau of Standards under the supervision of Gordon S. Scott at a large number of stations all over the nation.

The strong smooth polished surface is responsible for the action against soil stress as it presents a smooth bearing surface to the soil.

Aluminum Sheet & Structural Forms for Oil Tanks

The resistance of aluminum to sulfur and its compounds in contrast to iron, which readily combines with it, has been used to advantage in West Texas to handle bad crudes.

The hydrogen sulfide in the vapor section of tanks containing the oil as it comes from the well rapidly attacks steel; in some cases so rapidly as to create enough heat to start a fire, and combines with it to form iron sulfide in the form of scale. This scale drops to the bottom and forms pits in the bottom due to its reaction in conjunction with the brine. This has been vigorous enough to perforate steel tank bottoms in less than six months time.

Some 500-barrel tanks on the state Lassiter lease in Crane County, Texas, wherein aluminum was substituted for steel, in the first case completely, and in the second case for top ring, deck and rafters, have given two years of satisfactory service, and are still in good condition. In the composite tank where aluminum was used for the upper parts where it remained in good condition, the steel bottom and lower ring also were in good condition and had outlived bottoms from all the all-steel tanks in the same lease.

The results of this test were so favorable that an additional test was inaugurated under the supervision of the Bureau of Mines at Borger, Texas, to check the earlier findings. A complete report of this test will be issued shortly by the Bureau of Mines.

The Gulf Co. which made the early tests have since installed a large number of these tanks, realizing the economy of great-

This semi-trailer uses aluminum for the tank and for the chassis parts with the exception of the springs, axles, king pin and certain brake assembly parts. Increased payload: 1920 pounds

er than four times the life from an aluminum tank for but double the cost. This is, of course, for a complete aluminum tank; the composite aluminum and steel tank is proportionately cheaper. The scrap value of the aluminum after the tank has served its purpose also helps to compensate for the additional cost.

Although a slightly thicker section was used in replacing steel with aluminum, it was equivalent to only half the weight of the steel. Aluminum nuts and bolts were used to fasten the lap joints of aluminum sheets and the whole was braced by a framework of aluminum tees and angles. Pipe connections were made with cast aluminum fittings and aluminum tubing. Heating coils were of aluminum tubing.

Light gauge aluminum sheet has found a use in Gatrel type of roofing. Aluminum nails and bolts are rapidly displacing iron for the timber work on large storage tanks handling bad crudes.

Aluminum in Refinery Equipment

Due to its high heat conductivity and resistance to attack by high sulfur crudes, aluminum should be a desirable metal for refining equipment. Dr. Sidney[3], in some experimental work on small stills wherein the vapor lines, fractionating towers and condensing coils were fabricated of aluminum, has proved the excellent serviceability of aluminum in contact with all varieties of crudes including those with high sulfur content.

Aluminum bubble caps are being used by several refineries in their fractionating towers. These caps weigh about a pound and a half each compared to seven or eight pounds for cast iron caps. The saving in charging cost and cost of mountings for the towers with the lighter weight easily establishes the economy of aluminum for this purpose.

A large number of heat exchangers made from aluminum have been in service for several years and have given excellent service. Their high heat conductivity and the absence of rust and scale account for the excellent efficiencies that have been obtained on these items of equipment.

As aluminum can be fabricated to all sizes of pipe and can be easily formed and welded, it is an excellent material for vapor lines, condensing coils and movable equipment such as swing lines.

Due to its corrosion resistance, aluminum offers an excellent fabricating material for plants recovering natural gasoline, where sulfur gases naturally associated with the highly volatile fractions of crude oil are encountered.

Aluminum in Transportation Equipment

The distribution of the refined products to the retailer is a problem in itself due to the fact that the retailer is usually away from a railroad siding and must receive his supplies via the highway. Distribution therefore must be accomplished by motor truck tanks whose capacities are restricted only by the permissible weight limits of the various state highway departments.

The maximum payload amounts to the difference between the license limit and the weight of the chassis and empty tank. Thus, the only possible method of increasing the payload is to reduce the weight of the truck. This can be accomplished directly and economically by substituting aluminum for steel in the truck tank and equipment.

The first truck tank taking advantage of this weight saving was exhibited at the International Petroleum Exposition for 1929 at Tulsa. This tank had a capacity of 2400 gallons, and its gross weight, filled, was no more than that of a 2000-gallon steel tank filled to capacity. Economics indicate that the increased payload due to the use of aluminum would write off the added investment in 150 days, which amounts to a return of 200 per cent on that added investment for the average working year.

This weight saving was accomplished by substituting aluminum for steel in the tank and equipment such as expansion domes, manholes, pipe fittings, and accessories such as standard can racks, running boards and bucket box. In the year since this first tank was exhibited many manufacturers have built aluminum truck tanks and trailers ranging from 750 gallons capacity to 3500 gallons.

Among the largest are the bulk hauling units of the Sun Oil Co. of Philadelphia, consisting of a 3500-gallon straight frame truck tank mounted on a six-wheel chassis, and a 3000-gallon tank mounted on a four-wheel trailer. The unit adopted by the Three D Distributing Co. of Fort Worth, is a 3325 gallon aluminum semi-trailer tank and a 2875-gallon tank on a six-wheel trailer. The economics in every case have more than justified the increased cost of the aluminum over the steel construction.

The advantages are so reasonable that no doubt in the next year extensive substitution will be made in the chassis parts. Cabs, radiators and engine parts are already included and frames, wheels and axle housings are perfectly possible in aluminum.

Weight saving is possible because aluminum alloys are available which have the strength of the common steels. In designing, therefore, it is possible in most cases to substitute section for section in replacing steel. The aluminum weight will be only about one-third that of the steel, however, because the lighter metal has a density of only 2.7 compared with 7.9 for steel.

In some cases, to increase rigidity without a change of design, it is necessary to increase the section as much as 40 per cent. This is due to the low modulus of elasticity of aluminum, which is 10,400,000 pounds per square inch, as compared to 29,000,000 pounds per square inch for steel. In no case, however, is it necessary to go beyond more than 50 per cent of the steel weight when aluminum is used. In this field, as in aviation and other branches of transportation, the success of aluminum is due to strong alloys developed almost wholly within the past ten years.

The earlier trucks on which

[3] National Petroleum News, Vol. 21, Page 121.

aluminum was used were built solely to obtain larger payloads. Since then, operators have discovered other uses for weight-saving, and other advantages to be derived from the use of aluminum. Experience has pointed to the low maintenance cost of aluminum, its excellent appearance, and its high residual value.

Increased payload is the most obvious method of taking advantage of reduction of dead weight. However, where such is not possible or desirable, the weight saved permits the use of a lighter and cheaper chassis. Another alternative is that on the chassis improved schedules are permitted due to higher average speeds and greater flexibility in starting and stopping. Either method results in lower operating cost.

Aluminum does not rust or scale and therefore eliminates the necessity of frequent repainting of the outside and cleaning of the inside of the tanks. Streaking and discoloration cannot result from accidental scratching of the aluminum body and there is no progressive corrosion to lift the paint, as may occur on steel work. Natural finish aluminum tanks have a high visibility and are excellent appearance which in itself has good advertising value.

Should the aluminum body be wrecked or become obsolete the metal has a scrap value of approximately 70 per cent of the prevailing aluminum ingot price while steel is of little scrap value.

It is apparent from the foregoing that aluminum plays a varied role of service to the oil industry. The many forms in which the metal is used are significant indications that aluminum can be easily fabricated; it is available in any of the wrought or cast forms in which any of the commercial metals may be produced. To its workability, and to its favorable combination of chemical and physical properties, are due its value to the oil industry as a means of combatting losses caused by evaporation of product, corrosion of equipment, and dead-weight in product transportation.

New Refining Patents

Electric Heat for Cracking. U. S. P. 1 766 023, Sept. 16, 1930, application filed May 16, 1927; Wm. S. Hadaway, Jr., Assignor to the Texas Co.

ELECTRICAL heat for cracking has the advantages of close, accurate controllability and relative efficiency of application. A method has therefore been worked out for continuous pressure cracking, in which the bulk of the heat is cheaply imparted to the charging stock in a preheating coil, and the final increment of heat is applied electrically, under close control to give the optimum cracking temperature.

This is accomplished by passing the oil, first, through a high pressure heating coil in a suitable furnace, then through an electrically heated conduit which is accurately regulated to cause the oil to issue therefrom at a selected constant temperature. From this conduit the oil passes into a heat-insulated cracking chamber, where additional heat may be supplied if required.

The invention is also applicable to improved control of distillation processes, whether or not they involve cracking operations. For instance, it may be used for very precise control of a stripping plant.

What Is Claimed

In the conversion of high boiling to low boiling hydrocarbons, supplying the bulk of the heat to the oil as it passes through a coil in a furnace which is not adapted for close regulation, and supplying a smaller regulated increment of heat by immediately passing the oil through an electrically heated tube and regulating the electrical heat input to maintain a predetermined outlet temperature.

* * *

Tube-and-Drum Cracking Apparatus. U. S. P. 1 774 188, August 26, 1930, application filed January 28, 1925; Jean Delattre-Seguy, Assignor to Universal Oil Products Co.

THE principal difficulties in the tube-and-drum method of cracking oils have been excessive coking, both in coil and drum, and excessive loss due to formation of fixed gases. A modification of the process has now been developed, in which coking and formation of fixed gas are materially lessened, and carbon deposition in the heating coil is practically eliminated.

The leading feature in this improvement is that part of the vapor is withdrawn from the reaction drum, superheated, and blown back into the liquid in the drum. This blast of superheated vapor contributes in three ways to the economical conversion of heavy into light hydrocarbons: 1) it maintains the body of oil at optimum cracking temperature; 2) it agitates the oil, thus keeping the carbon in suspension so that it is easily removed; 3) by recombining the superheated vapor with the liquid components, it favors the cracking reaction and so increases the yield of desirable light hydrocarbons. By maintaining optimum cracking temperatures in the drum, it also enables the heating coil to be operated at a temperature at which little or no carbon is deposited in the tubes.

In a test run, made without this feature of the invention, the oil was heated to 880° F. in the heating coil, and 860°F. in the drum; the yield of gasoline was 40 per cent, gas oil 25 per cent, fixed gas and coke 5.5 per cent, residium 29.5 per cent. With the added feature of superheated vapor return the same charging stock yielded 47 per cent of gasoline, 23 per cent gas oil, 28.7 per cent residium and only 1.3 per cent coke and fixed gas. The temperature in the heating coil was only 730° F; in the drum, 850°F.

What Is Claimed

Cracking oil by heating to a cracking temperature, passing to an enlarged reaction zone where vaporization occurs, augmenting the conversion reaction by withdrawing part of the vapor, superheating it and returning it to the reaction zone under pressure.

Rundown tanks equipped with Wiggins floating roofs

Fire and Corrosion Resisting Qualities Of Breather and Floating Roofs

By John H. Wiggins*

EVEN ice will evaporate at temperatures below freezing. This fact should help explain to anyone the great tendency for gasoline or volatile petroleum to evaporate at temperatures that are encountered in tanks. Whatever this tendency may be, it is now possible to reduce such loss to a nominal amount and in a practical and economical manner.

About one hundred million dollars per year is our national evaporation bill today. The improved methods of, and apparatus for, the handling of oils have been developed by the companies benefiting from the saving and also by manufacturers of equipment who profit from sales.

Loss in Value by Evaporation

A simple calculation will serve to bring home the economic loss sustained, for example, by a 1 per cent volumetric loss. The producer or storer of crude might say to himself; —"1000 barrels x .01 = 10 barrels. At $1.50 per barrel, this is only $15.00 loss." But at the rate of 5 cents drop in price per degree A. P. I. drop in gravity, he loses more dollars by the price per barrel route than he does by the loss in volume.

A 1 per cent volumetric loss roughly means 0.4 degrees A.P.I. drop in gravity of the whole amount of oil. Considered on the average, this 0.4 gravity drop will affect the price of a barrel of oil to the extent of the price differential per degree A.P.I. If the latter is 5 cents, then the loss in price per barrel on the average with a 0.4 degree drop is 5 cents x 0.4 or 2 cents per barrel. This latter figure unfortunately applies to the whole amount of oil that is left.

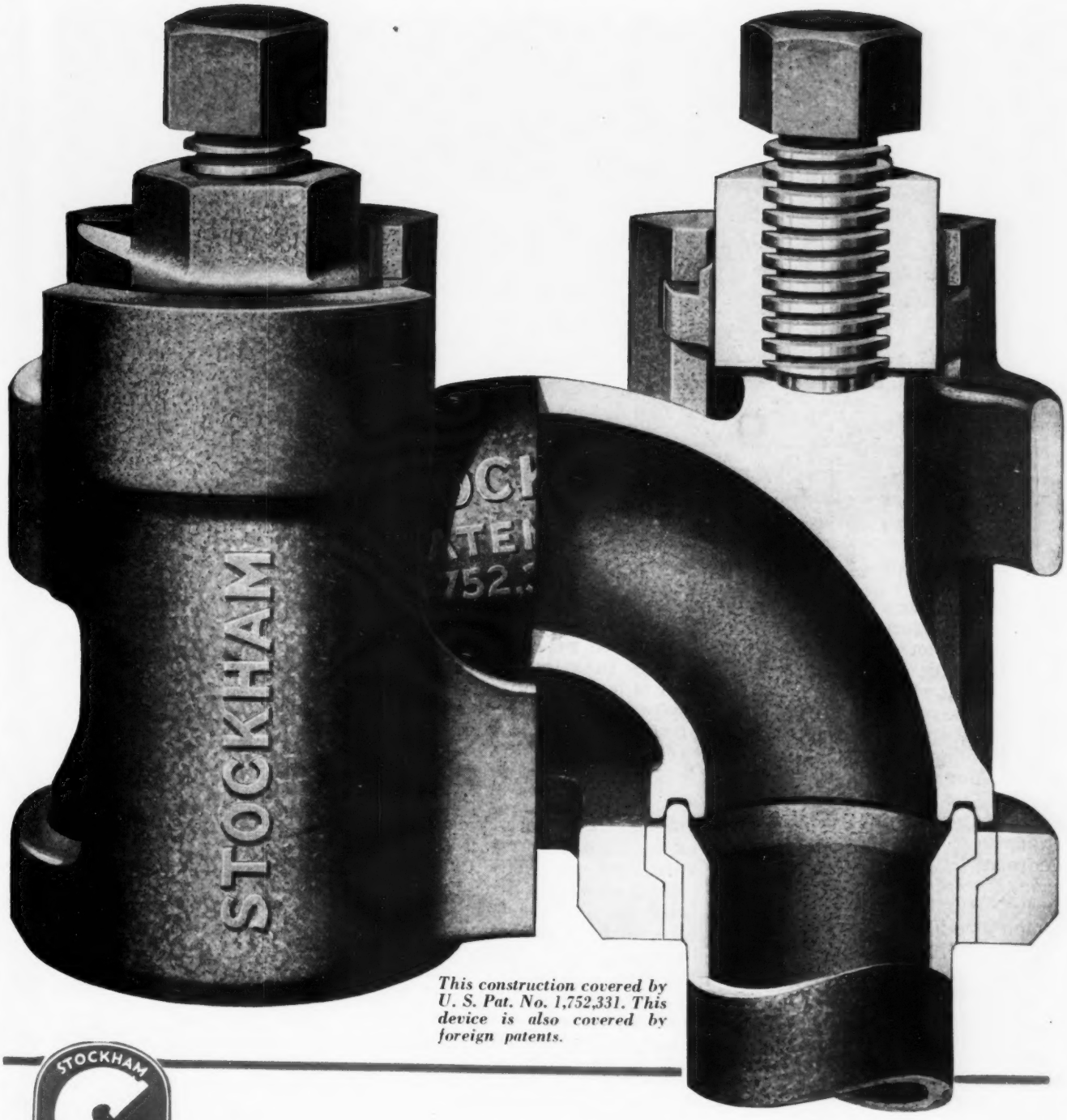
In the above example the original amount of oil is 1000 barrels. The volumetric loss is 10 barrels. The 2 cents per barrel applies to 990 barrels and is equal to $19.80. The $19.80 is an addition to the $15.00 incurred by losing 10 barrels of $1.50 oil.

Another way to consider this is:—without loss he would sell 1000 barrels for $1500.00 while with the loss he sells 990 barrels at $1.48 or $1465.00, a total loss in dollars amounting to $34.80.

The $34.80 divided by $1500 gives 21/3 per cent. Thus there is another rough rule developed:—For each per cent of volumetric loss there is a 2 1/3" per cent value loss. This is exactly true for $1.50 per barrel crude and a 5 cent differential per degree A.P.I.

The main purpose of breather and floating roofs is to prevent evaporation of the volatile fractions of petroleum and its products. The second most valuable purpose (now that so much highly corrosive crude is being produced and highly corrosive fractions are being made by the ever-enlarging amount of crack-

*John H. Wiggins Co., Tulsa.



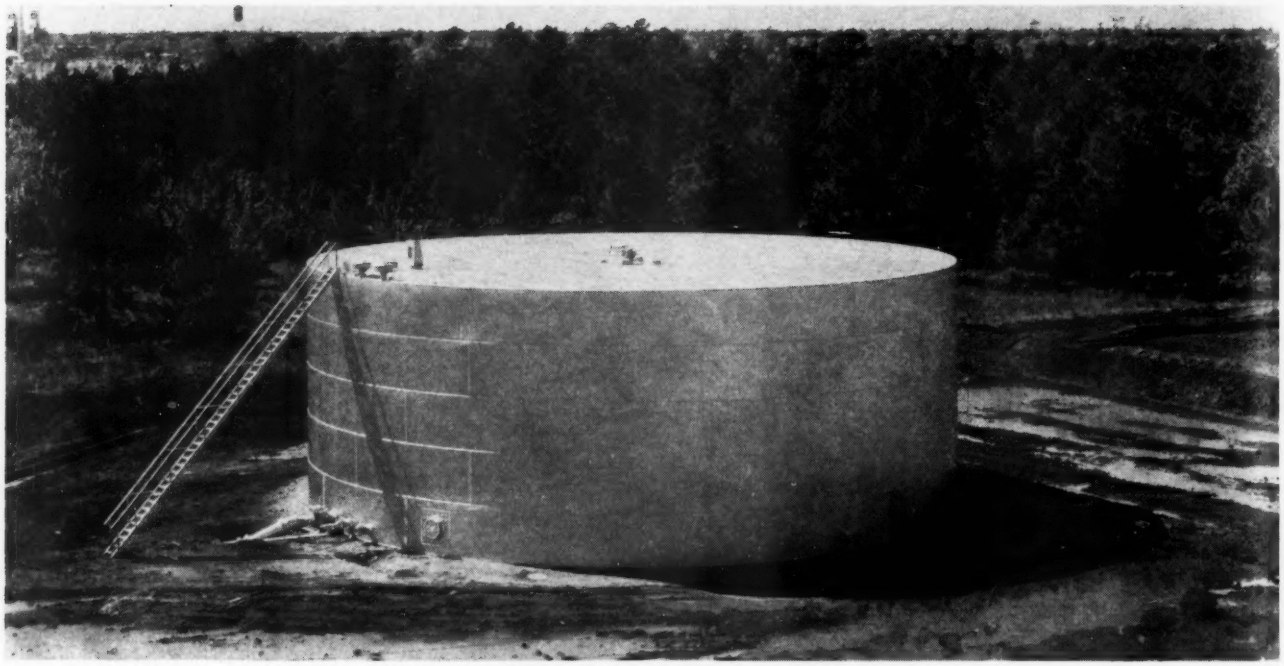
This construction covered by U. S. Pat. No. 1,752,331. This device is also covered by foreign patents.

STOCKHAM RETURN BEND

There is a STOCKHAM FITTING for every oil requirement

ELECTRIC CAST STEEL—CAST IRON—MALLEABLE

STOCKHAM PIPE & FITTINGS COMPANY. ***Birmingham, Alabama***



Breather roof tank partially inflated

ing) is to reduce greatly and in some cases practically eliminate corrosion of the roof with the attendant feature of reducing corrosion of the tank shell and bottom. The third purpose is to reduce the fire hazard.

In the case of the floater, explosion hazard is entirely eliminated; destructive fires are practically eliminated and the chances for any fire at all are decreased very much. In the case of the breather used for storage the chance of initial ignition is only a small fraction (one per cent or less) of the times that gas tight steel tank might be ignited.

The reason for this is that the breather is absolutely hermetically sealed during more than 99 per cent of the minutes or hours that a similar gas-tight tank is emitting gas. The breather may stand for several days without the vents ever opening to emit gas and then it will be just for a few minutes or seconds. There will be only a very brief discussion of how and why each structure accomplishes each of the above results.

The Floater

Evaporation: For oils having an initial boiling point of 100° F. or higher, this roof shows a lower volumetric loss for tanks that are held as storage tanks than any other generally marketed roof except the breather. However, since the latter roof has become available and has been in service long enough to prove its value and proper functioning, the floater will more and more be used for tanks that have large quantities of oil pumped into and out of them annually.

In other words, the floater is especially well adapted to stop practically all loss in "working" tanks. To understand this we will start with a 55,000-barrel, cone roofed gasoline tank containing 53,000 barrels. This tank is pumped out until 3000 barrels remain in the tank. During the process of emptying, 50,000 barrels or 281,000 cubic feet of outage has been created. In the case of a gas tight roof, this space is filled with about 40 per cent gasoline vapor and 60 per cent air.

The tank is now filled until it again contains 53,000 barrels of gasoline. During the process of filling at least 281,000 cubic feet of air plus vapor have been pumped out through the vent. Of this 281,000 cubic feet, 40 per cent or 112,400 cubic feet is gasoline vapor. This much vapor equals 3747 gallons or 89.2 barrels of gasoline of the most valuable quality. In addition to the 281,000 cubic feet displaced by pumping in, there is a further loss by thermal breathing. This latter is a variable and depends on the number of days required for the complete cycle of emptying and filling. Whatever this loss may be, it must be added to the 89.2 barrels.

This same tank with a floater would take in 281,000 cubic feet of fresh air, but this air would come in contact with the oil in the tank no more than if the pumping action had not occurred. Thus is presented the rather extravagant condition that, even theoretically with the FLOATER THERE IS NO PUMPING LOSS—only the nominal loss from standing and this depends on efficiency of the floater as a preventive of standing loss.

Standing Loss on Floater

The floating roof consists of two main parts, the main body or float and the seal which slidably joins the float to the tank shell. To thoroughly prevent evaporation, the float should be imperforate. The seal must have shoes that slide along the tank shell and a means for joining the shoes to the float.

The seal is then divided into two parts from the standpoint of evaporation:—first, evaporation between the shoes and the tank shell; second, evaporation between the shoes and the float.

The method used to stop evaporation between the shoes and the float is to join the shoes to each other and to the float by a flexible gas-tight and fire proof material, thus constructing an inverted gas-tight trough in which all vapors are

trapped and escape only through thermal breathing or by being forced out through the actual pumping of gas or air into the tank as is often done.

Stopping evaporation between shoes and shell: it is well known that gasoline vapor is about twice as heavy as air. This physical condition is taken advantage of in the following manner: the shoes are made very tall and are supported from the float in such a manner that they may always remain substantially parallel to the tank shell. In addition, the shoes are curved circumferentially to fit the shell. This creates a tall, narrow, annual slot about 30″ high, varying from nothing to perhaps three quarters of an inch when passing over very large rivets.

The heavy mixture of air and vapor hangs in the bottom of this ring and really creates a "floating roof" of vapor for this small area. The mixture is only very slowly forced out by two causes: the force of diffusion, which acts very slowly through such a long, narrow distance, and the pumping action of breezes.

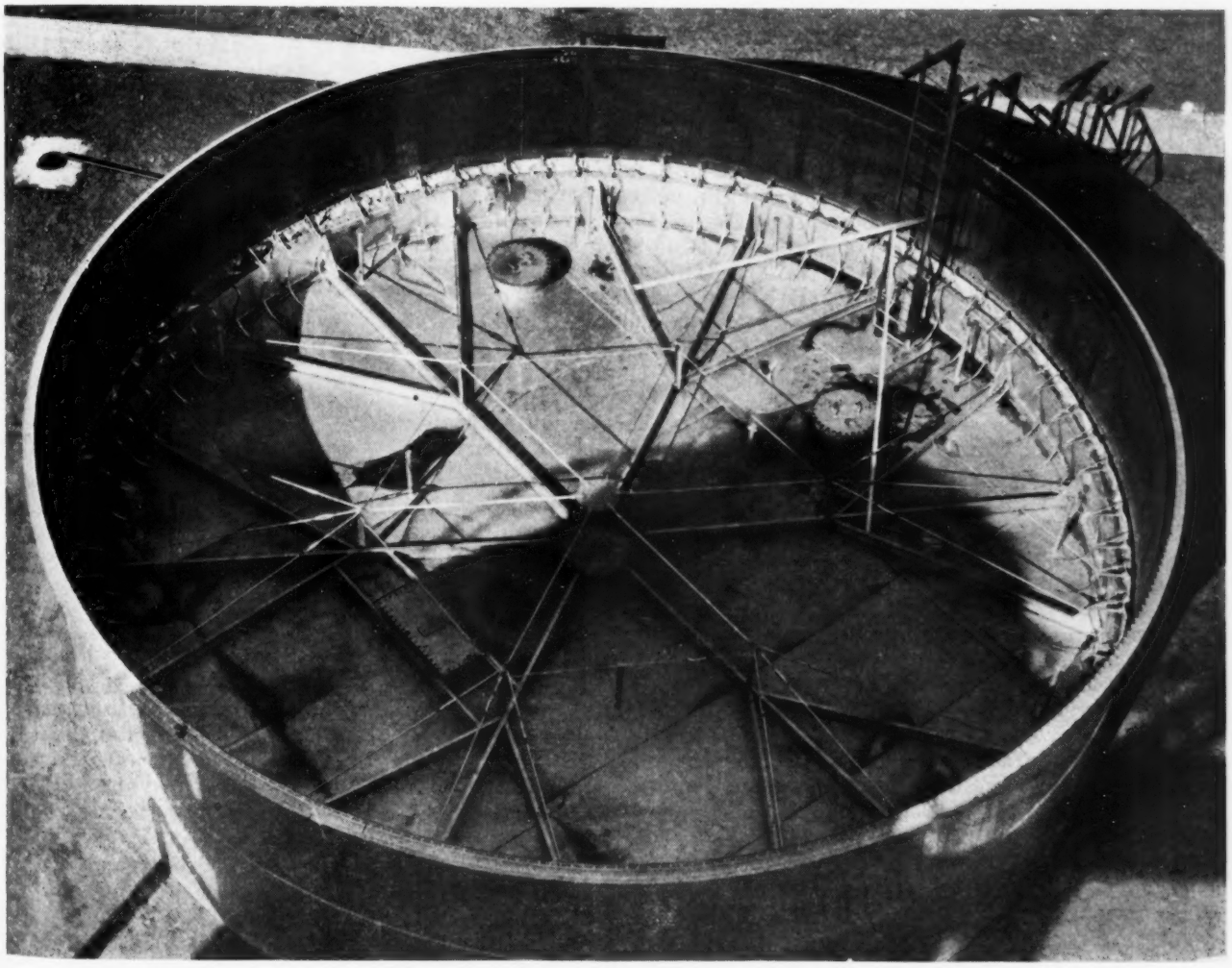
All the causes for evaporation at this seal have been overcome so effectively that a 115-foot diameter roof will lose only from 50 to 125 barrels per year from crude oils and from 150 to 400 barrels from gasoline, the latter having initial boiling points of 100 F. or greater.

Naturally, great care must be taken to install this seal so that the objects intended are actually accomplished. It is generally known by engineers that pinholes in a so-called gas-tight tank will double or treble its evaporation loss. The same is true of the floating roof seal, the physical laws cannot be ignored and still get perfect results.

To give some idea of the necessity for any seal at all, if a 115-foot diameter crude oil tank had a floating roof with no seal at all and an 8-inch open annular ring, the daily loss in summer would be from eight to 16 barrels as compared to one and five-tenths to three barrels per day from a gas-tight, cone, steel roof. The seal described in the above paragraph is 95 per cent efficient or better. If the seal were only 60 per cent efficient it would show a daily loss of about 3.2 barrels. Even if the seal is 80 per cent efficient it shows a loss of 1.6 barrels a day, which is about the same as a gas-tight tank. Thus it is seen that a floating roof seal must be efficient to make the entire structure of great value as a preventive of evaporation loss.

Corrosion and the Floater

High sulfur or sour oils attack steel most rapidly whereever there is an air space above the oil. During cool periods water condenses on the inside of the tank and forms one of the greatest aids to corrosion. The under side of the floater being always and entirely submerged in the oil is protected from the oxygen in the air and the dew.



Looking down on small floating roof type tank

The only part of the floater subjected to much corrosion is the inside of the rim and the seal.

For corrosive oils, the seal supporting mechanism is placed outside the seal so that this important part is not attacked at all. The rim is always one quarter of an inch thick and this may be increased to any desired thickness. Since the area of the inside of the rim and seal is comparatively small, it can be coated with preparations at low cost relative to a cone roof and inspection and application can be accomplished without taking the tank out of service.

An entire new seal can be installed without stopping the working of the tank. In the worst case, namely, where the rim has finally corroded through, the only part of the roof to replace is the rim and seal. It is not ncessary to open the seal to gauge, therefore spontaneous combustion is less likely, and in any case no explosion of the roof is possible and only a small, easily extinguished fire can occur even with sulfur oil. Large numbers of these roofs are in service on West Texas crude tanks.

Fire and the Floater

From 95 per cent to 98 per cent of the oil surface is covered with a steel blanket. Within this area there is no reason to expect a fire, since the oil needs oxygen to burn and within this area the oil can get no oxygen. The principle involved is the same as that involved in the use of fire foam. As far as fire is concerned, the portion of the liquid surface covered by the float may be considered as having a permanent layer of foam through which no gas can escape.

For real economic fire protection, the above is all that is necessary. A very exacting test has been made on a floating roof wherein the seal was entirely taken out. The purpose of the test was to determine whether a fire allowed to burn thus would ever harm the rim of the float or the tank shell. The tank shell got red for a few inches above the liquid line but the rim of the roof was heated much less than the tank shell.

The reason for this was that the air currents set up by the fire carried the flames away from the rim and towards the shell. After 10 minutes burning the tank got no hotter and after 55 minutes burning the fire was easily extinguished by spraying foam through a piece of bent pipe held over the top edge of the tank shell and carried around the tank. This tank was 30 feet in diameter, its circumference being over one fourth that of an 80,000-barrel tank.

The seal which is placed between the float and tank shell will really prevent the starting of a fire except where sulfur deposits are made on the inside of the rim and seal. In this case spontaneous combustion may cause a fire which may or may not be automatically extinguished. But in case the fire is started it will be a fire some five to 40 feet long by eight inches wide around a part of the circumference of the roof. This fire is easily extinguished by a portable foam container at low cost.

There are something like 1500 of these roofs scattered all over the world.

The Breather

Evaporation and the breather: The standard breather is a steel welded or riveted roof which slopes downward from the outside circumference toward the center for a short distance, and then is level to the center, thus forming an inverted frustrum of a cone whose altitude is eight inches. This sheet of steel can rise from 20 to 28 inches at the center, forming a dome. The rise depends on the tank diameter. A 7117-foot diameter breather rises 24 inches and has a capacity of about 12,000 cubic feet.

This roof can be used to great advantage on any volatile oil tanks whether a "worker" or a storage tank. On a "worker" it will show a great saving in barrels over a gas-tight roof, because daily the 12,000 cubic feet of air-vapor mixture is saved, amounting to from one to five barrels per day.

The greatest percentage of saving with the breather roof is on crude or gasoline tanks that are held for considerable lengths of time full or nearly full, for under these conditions the expansion of the roof is sufficient to take care of the daily volumetric change of the gas to temperature variations. Thus on these tanks, evaporation is practically eliminated.

There is another class of tankage which often comes on the border line as to whether the floating roof principle or the expansible roof principle should be used. This is the marketing tank. These tanks are filled in a short period of time from tankers or tank cars and then are slowly drawn from, it requiring from a week or two to several months to empty them.

A calculation must be made wherein is considered the volume handled in and out per year, the relative cost of the two roofs, and the value of the gasoline. On such tanks a breather of capacity about double that of the standard can be built at a small increase in cost which will still leave the breather quite a bit below the cost of the floater. There is no general recommendation that can be made in cases like this as too many variables enter.

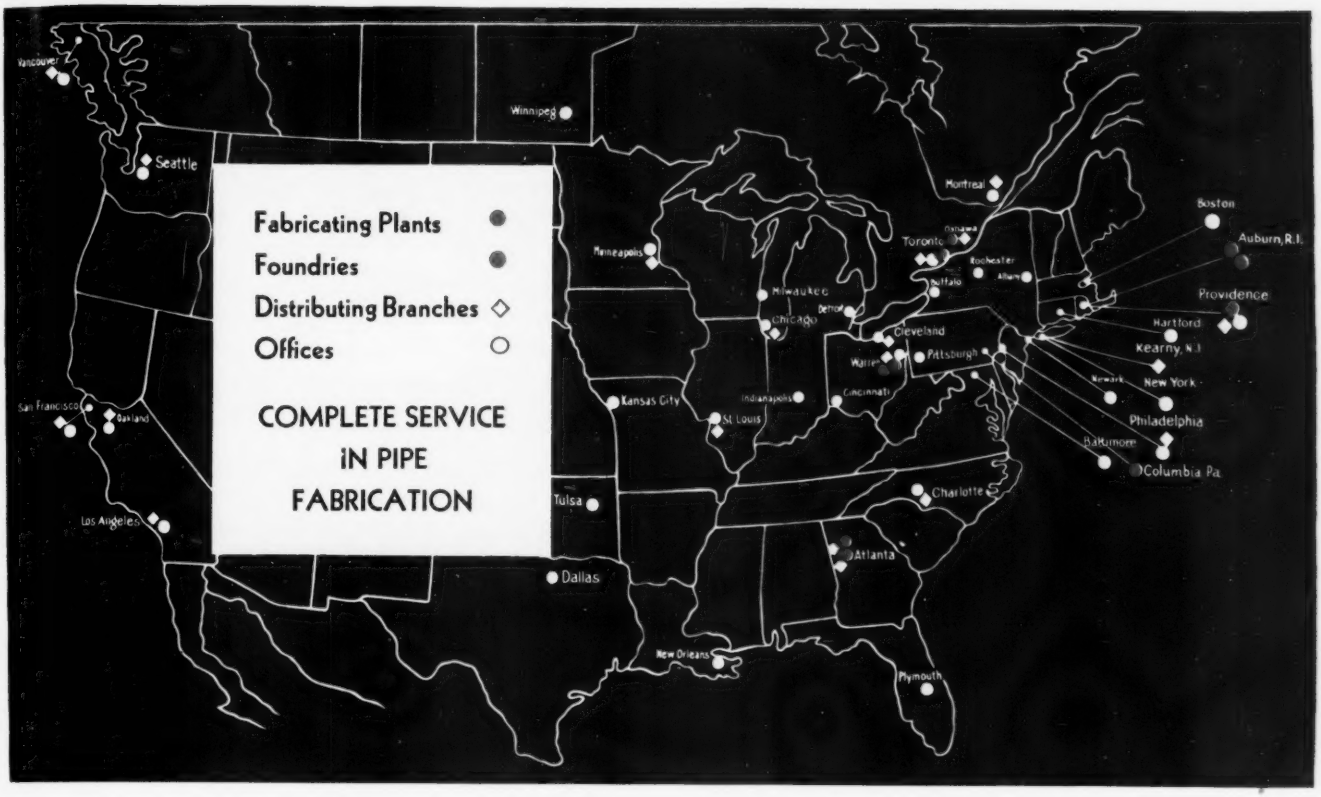
Wherever the vapor recovery system is installed the breather roof may be used to do the work of the pressure regulators. The movement of the roof is utilized to operate all valves between the vapor recovery system and the tank. So much power is thus available that there is no chance of sucking in a tank. A full vacuum could be placed on the recovery lines and not affect the tank.

Corrosion and the Breather

When high sulfur oils are stored, this roof may be used in such a way as to practically eliminate corrosion of the roof. Since the deck is flexible, the tank can be filled to a point which is "more than full." In other words, oil is run into the tank until its surface is for example, one inch above the top of the tank. At this point a vent is opened by hand and all the air-vapor allowed to escape. The roof settles on to the oil and leaves no air space at all.

Now as the tank of oil heats and expands, the roof rises. After the deck has risen six inches the oil starts to overflow from a 2-inch pipe, the overflow point of which is raised eight inches above the top of the tank. The overflow oil is carried by 2-inch pipe to a small collecting tank which serves a large number of big storage tanks.

When cooling weather



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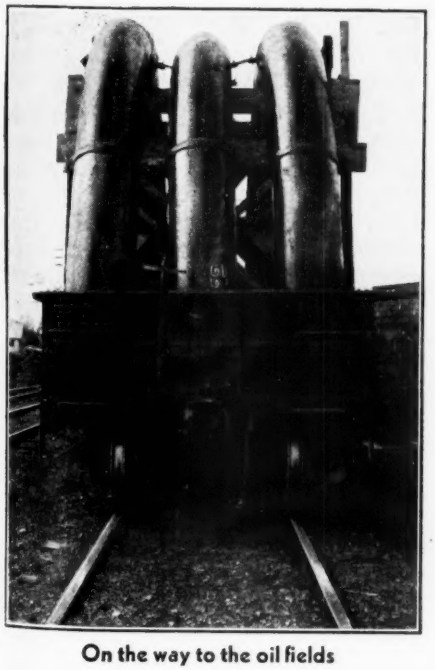

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arrives, the deck will gradually lower. Just before it would take in air, about six hundred barrels of oil should be pumped into the tank, thus again raising the roof well above the top angle. A single refilling like the above per year will just about take care of the thermal volumetrie changes of the oil.

This process of storing oil practically eliminates corrosion, evaporation, and fire, because there is no air in contact with the oil, except in the small overflow tank. The latter contains such a small proportion of the total oil in storage as to be negligible.

About six million barrels is now in storage as above described. An 80,000-barrel tank actually stores 80,800 barrels. This fact cuts down the cost per barrel of storage, when it is considered that an ordinary 80,000-barrel tank at most contains 79,000 to 79,500 barrels.

Fire and the Breather

This structure has all the fire prevention qualities of a gas-tight steel roof properly vented and has additional fire preventing qualities peculiar to its operation. It has two advantages over the gas-tight pressure vented roof. First, if used as a storage device as above outlined, all air spaces and hence all ordinary fire hazards, are eliminated. The only cause of a fire that can be imagined is to have a direct stroke of lightning rip the tank shell or the roof. Second, if used as a gas breather on nearly full tanks, the vents practically never open. Moreover, during a thunder storm, the roof would generally be raised and the cooling effect of the storm would merely cause the roof to lower without the intake of any air. The air intake of a cone roof must form a considerable volume of perfect explosive mixture—the dividing volume between pure air and vapor saturated air.

The oldest breather is about three and one half years old. Over 200 of these structures are now in operation. The principles involved in this structure are very simple. It certainly visualizes evaporation loss in a very striking and instructive manner.

Just this summer, the mechanical principles involved in the breather roof have been applied in a new and novel manner to collect the vapors from a gas-tight roof. A double diaphragmed Wiggins gasholder, having 22,000 cubic feet capacity and of very low pressure, was built and connected to gasoline and crude tanks. In this structure, the bottom flexes in just the same manner as the top, thus obtaining great capacity at low cost. This low pressure holder is then connected to the tanks by piping. The movement of the roof accomplishes all venting which may be necessary, thus insuring against the pulling in or lifting off of the cone roof.

Gasoline tanks from half full to practically full were tested for vapor expulsion and the volumes collected in the day and returned at night were astonishingly great, and much greater than any similar data yet published. This entire system is susceptible of hermetic sealing, thus insuring reliable data. Unfortunately at this time, these data have not been analysed and catalogued and therefore will not be published.

This new structure seems to have great possibilities in the field of saving evaporation from present installations of gas-tight roofs and with modifications, this new type gasholder can enter the field of commercial holders. Its cost per cubic foot is lower than any known type of holder and it has practically no moving parts.

Summary

These roofs have been discussed as briefly as possible from the three standpoints of evaporation, corrosion and fire. Description of mechanical features has been omitted. It would seem that excessive or even customary evaporation losses are unnecessary. The evaporation of gasoline blends containing high percentages of natural gasoline with its attendant permanent gas in solution has not been discussed in this paper. These are possible of evaporation proof storage only with five to twenty pounds per square inch gauge pressure or by stabilizing them. The amount of such gasoline that should not be stored under either of these roofs is a very small percentage of the total.

NEW EQUIPMENT

B. F. Sturtevant Co., 1042 Wrigley, Bldg., Chicago, has off the press its new oil refinery bulletin No. 375 describing and illustrating Sturtevant high temperature recirculating fans, air preheaters, high pressure propeller fans, oil economizers, turbines, engines, motors and mechanical draft fans for boiler houses.

Two types of recirculating fans for cracking units are made by this company, the propeller type and centrifugal type to keep the excess air at a minimum and reduce temperature by properly controlled recirculation of the exit gas. These are designed for temperatures of 1200 to 1400 F.

A diagram and illustration show the use of its air preheaters with DeFlorez stills and an illustration shows them used with a Dubbs cracking unit. Turbines, engines and motors are prime movers for oil and water pumps, air or gas compressors, and other refinery equipment, are described.

* * *

Book No. 3 of "Hydrogen Ion Measurements" issued by the Leeds and Northrup Co., Philadelphia, contains a brief but thorough discussion of the meaning of hydrogen ion measurement and values to the plant operator and chemist concerned in measuring the acidity and alkalinity of boiler and other waters and the means employed of obtaining this information by electrical methods.

The booklet also discusses at length the various type of apparatus used in determination, methods of setting up, and theoretical and practical considerations of immediate interest to the laboratory man. Directions are concise and precise, constituting a fairly complete operating manual. Presentation of the fundamental and practical limitations of such methods enables the operator to proceed with a better knowledge of what to expect and to watch for.

Recent Methods of Utilizing Waste Refinery Fuels

By L. A. Mekler*

Part I

THE use of non-salable by-products of oil refining as fuel in the refinery is increasing from year to year. The desire of the refiner to reduce fuel costs and, therefore, manufacturing costs is not the only reason for the wider use of the by-products. In many instances, the nuisance of storing or disposing of these by-products is a more important cause of their utilization than their fuel value.

Many refineries that started in virgin territory where space was unlimited, now find themselves surrounded by other industrial enterprises or by residential districts. Coke piles, sludge ponds, slop sumps, and smoky field gas torches, therefore, become a nuisance and in many cases a fire hazard. The disposal of refinery by-products and their use as a fuel becomes an economic and social necessity.

The chief refinery by-products are heavy liquid and semi-liquid residues from deep cracking of heavy fuel oils, slop oils, tank settlings, acid sludge, petroleum coke, and refinery gases.

Heavy Fuel Oil

The burning of heavy liquid and semi-liquid residues from reducing stills and cracking processes, is no longer a serious problem. It consists mainly in the proper design of the fuel oil circulating line and the use of fuel regulating valves and burners with large unobstructed passages for the oil.

Fig. 1 shows a parallel flow fuel oil circulating line successfully used in a large number of refineries. With the parallel flow fuel oil circulating line, each unit, or at least each group of closely spaced units, receives its fuel supply from the main supply header independently of the other units and discharges the surplus circulated at the unit into a main return header, also independently of the other units. The pressures on the main supply and the main return headers are maintained substantially constant by varying their cross section according to the quantity of oil flowing through them and the pressure at the individual service headers at the units is controlled by the back pressure orifice plates installed on the service headers.

THIS is the first of two exclusive articles by Dr. Mekler on this subject to appear in National Petroleum News. The second article, appearing Nov. 19, will take up petroleum coke and refinery gases.

Since the total quantity of the oil circulated through the system is from three to four times the amount burned by the units, the regulation or even complete shutting down of a unit or a group of units operated from a common service header does not affect the operation of the other units. On the other hand, an increase or decrease of flow through the service header lowers or raises the pressure on the header and decreases or increases the supply of the oil to all the burners on the unit so that master control regulation of a number of burners can be obtained from one valve.

With multi-burner arrangement now commonly used on refinery heaters, master-valve controls give simpler regulation and with the larger quantities of oil flowing through the master valves they are less liable to plug than the valves on the individual burners. In many cases the burner valves are used as shut-off valves only, unless the fuel consumption by the individual burners is varied to obtain the desired temperature distribution.

Where the fuel oil valves on the individual burners are used for control best results are obtained by use of a V-port, or other gradual opening valves of the gate or pet-cock type. With fuels of high B. S. content, multi-port valves with different size openings are often used. By changing the pressure on the service header, a wide range of burner regulation can be obtained with not more than three fixed openings in the valve.

Fig. 2 shows a plunger type angle fuel-oil regulating valve used on fuels containing as high as twenty per cent B. S. Similarly to other valves for the service, a triangular opening is maintained all the time, and the lowering or raising of the plunger determines the size of the opening. A guide in the valve body engages a pin on the plunger which prevents the rotation of the plunger with the turning of the valve stem.

Heavy residues are best handled hot. In many installations the residue is pumped from the units where it is produced to the fuel tank only partially cooled. This eliminates the necessity of heaters for the fuel. The fuel oil circulating lines are sufficiently insulated to avoid excessive cooling of the oil while being circulated. They should also be designed to allow for expansion. If possible, the hot fuel

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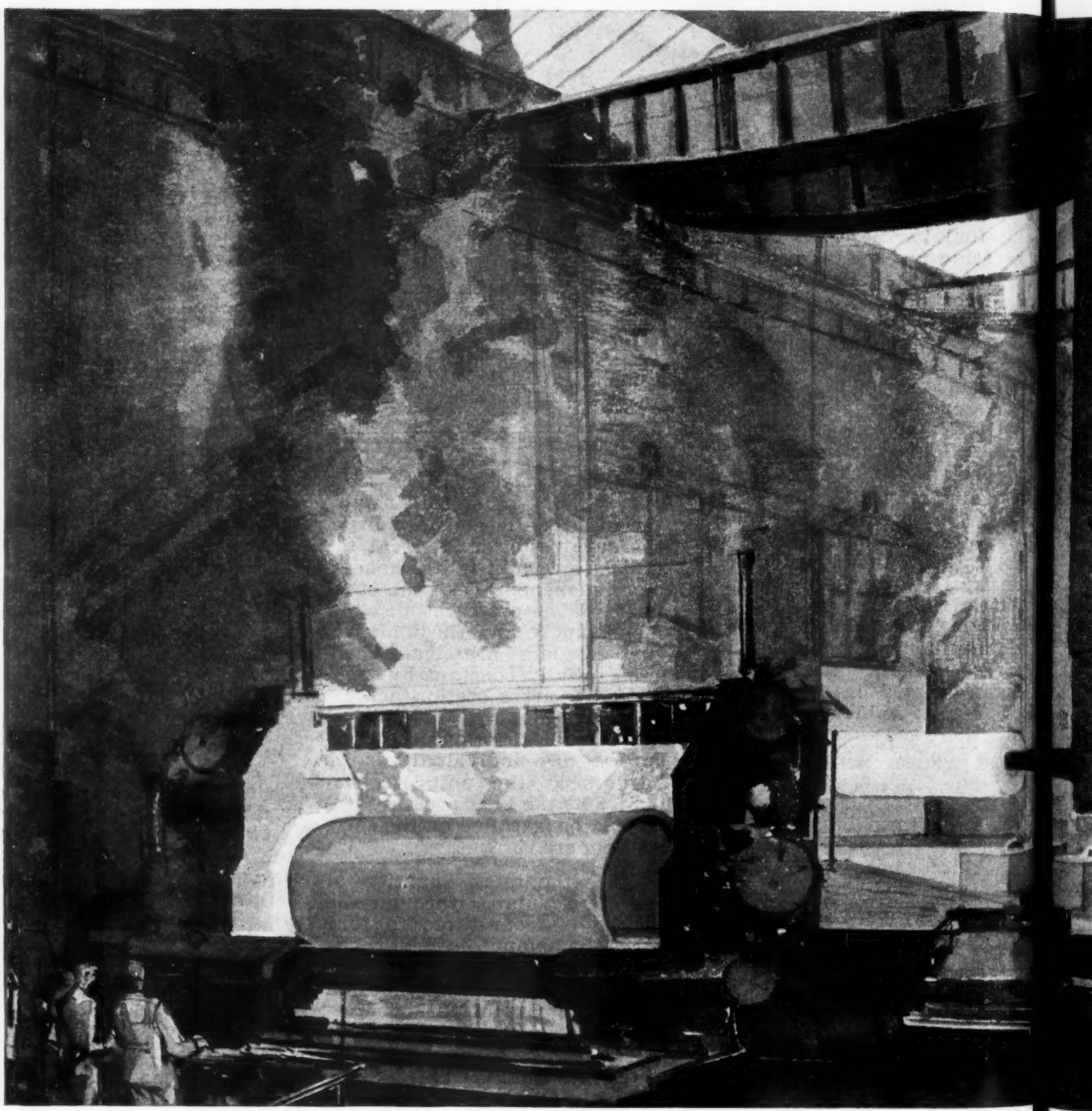

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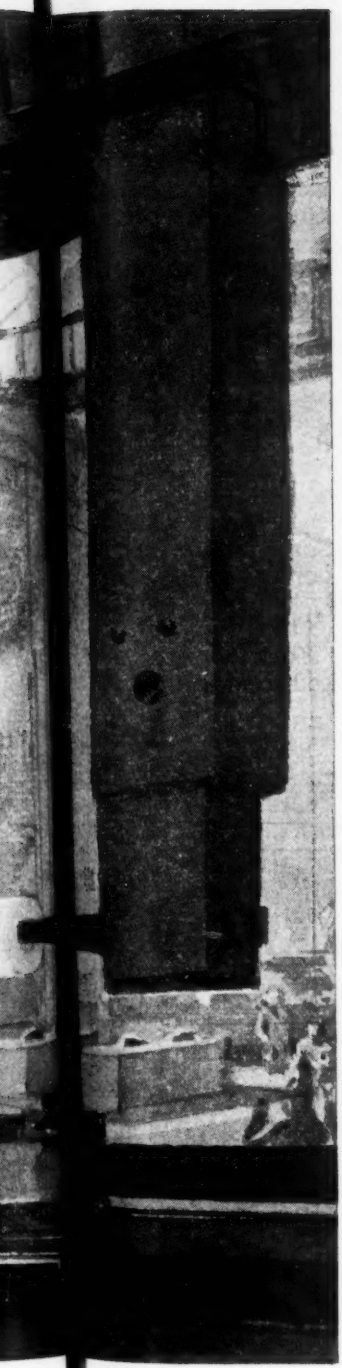

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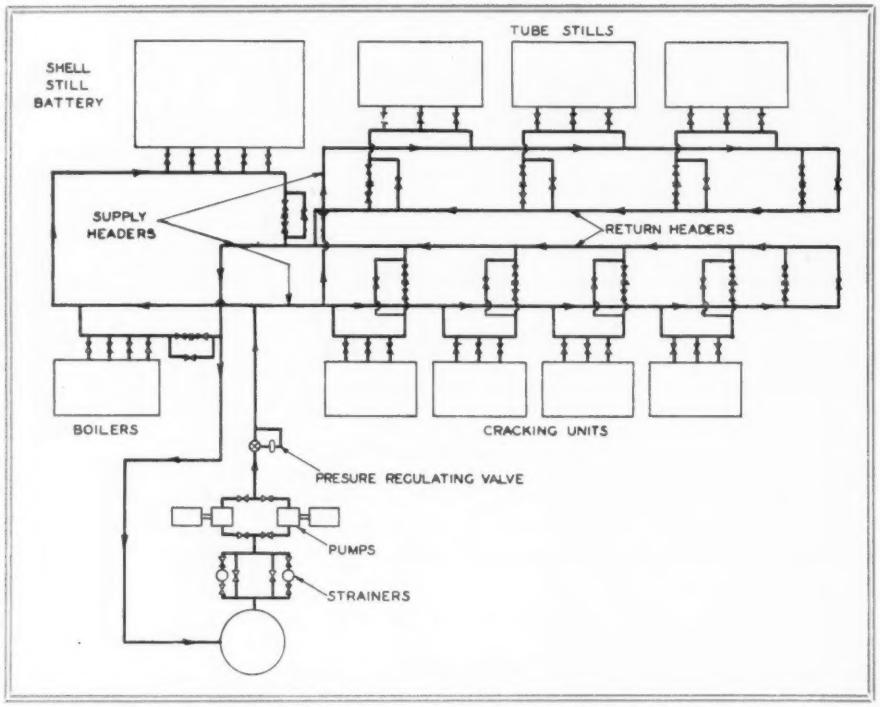

Fig. 1—Parallel flow fuel oil circulating line for refineries

is fed into the fuel tank continuously at a rate equal to the consumption of the fuel by the units, the hot fuel acting as the preheating medium for the fuel in the tank.

Where the circulating lines are long, and where the cooling of the oil is greater than can be compensated by the surplus heat of the incoming hot fuel, the oil is additionally heated in the tank by steam coils. In extreme cases "booster" heaters are used at different points of the fuel line, or the fuel lines are strapped to steam lines inside a common insulating jacket.

The temperatures to which a heavy fuel oil must be heated, depends on the viscosity, B. S. content, and the quantity of light material in it. The fuel oil must be made fluid enough to atomize properly but not too fluid to begin dropping out the B. S. Under no circumstances should the fuel oil be heated above its flash point or to a temperature where a large proportion of the light fractions will evaporate and form vapor pockets in the line.

Acid Sludge

Acid sludge, particularly the sludge produced in the manufacture of bright stock, is one of the most troublesome by-products and acid sludge ponds are a common sight in refineries. Many of the larger Mid-Continent refineries estimate the quantity of their sludge in acres of pond area rather than in tons or barrels. Until very recently, acid bright stock sludges were used only in small quantities, usually after preliminary treatment. The fresh sludges produced by the treatment of distillate products were occasionally burned in blends with liquid fuel. With the method of preparation used in the past, these sludges constituted only a small proportion of the blend, and the blended fuels were burned under the boilers without any regard to boiler efficiency or smoothness of operation.

In the last few years, however, considerable progress has been made in the utilization of acid sludges and fuel. At present a number of refineries burn fresh sludges as liquid fuel in blends containing up to fifty per cent of sludge, not only in their power plant, but also under the heaters of their topping and Cracking units.

With proper provisions for blending, storing, and transporting, acid sludge can be burned in conjunction with other heavy liquid fuels without much more trouble than the heavy liquid fuels themselves. The major problem in burning sludge in a blend with heavy fuels is the thorough mixing of the sludge with the blending fluid and the constant agitation of the blend while it is transported through the fuel oil lines to the burners. The gravity of the blending fluid, the temperature at which the blend is made and the thoroughness of the mixing determine the stability of the blend. The heavier and more viscous residues from reducing stills and cracking processes are better carriers of the sludge than the lighter fuels, and temperatures above 250° F., should usually be avoided both in blending and transporting because at the higher temperatures the sludge particles will separate from the blend and cake on the surfaces of the pipes or the storage tank.

Fig. 3 shows a schematic arrangement of a sludge-blending system successfully used in one of the Mid-Continent refineries. The blend consists of approximately forty per cent bright stock sludge, ten per cent P.D. sludge, and forty per cent of heavy cracked residuum.

Two old agitators are used

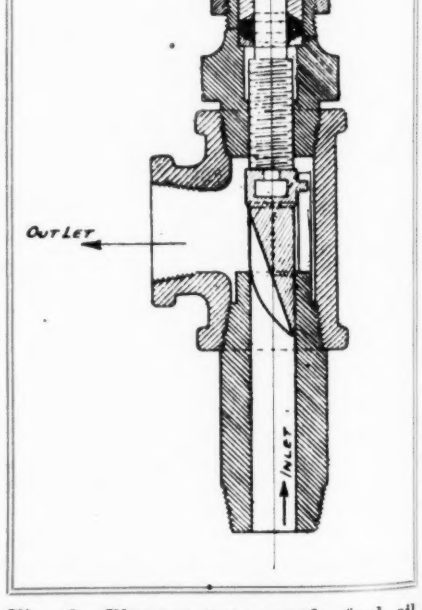

Fig. 2—Plunger type, angle fuel oil regulating valve

alternately for making the blend. The proper quantity of hot residuum is pumped into the agitator and the sludge added gradually while constant circulation is maintained in the agitator. A bronze magma pump is used, and when all the sludge has been added the agitator is blown for three to four hours. After each batch is finished the agitator is emptied, and, cleaned if necessary. A somewhat non-uniform mixture is obtained in the agitators so that further mixing is carried out in the storage tanks located at the fuel consuming unit to obtain a smooth blend.

The storage tanks are equipped with mechanical agitators to supplement the agitation produced by continuous circulation of the blend through the fuel-oil system of the units drawing upon the storage tank. High speed rotary pumps are used for circulation. These pumps, trimmed with alloy steel, incidentally act to homogenize the blend so that after a short time of circulation through the fuel oil system the blend has a considerably better texture than when it left the agitators. Approximately four times the quantity consumed by the units is circulated through the fuel oil lines. The fuel is maintained at a temperature of 200-220° F., and is burned in "home-made" internal steam atomizing burners.

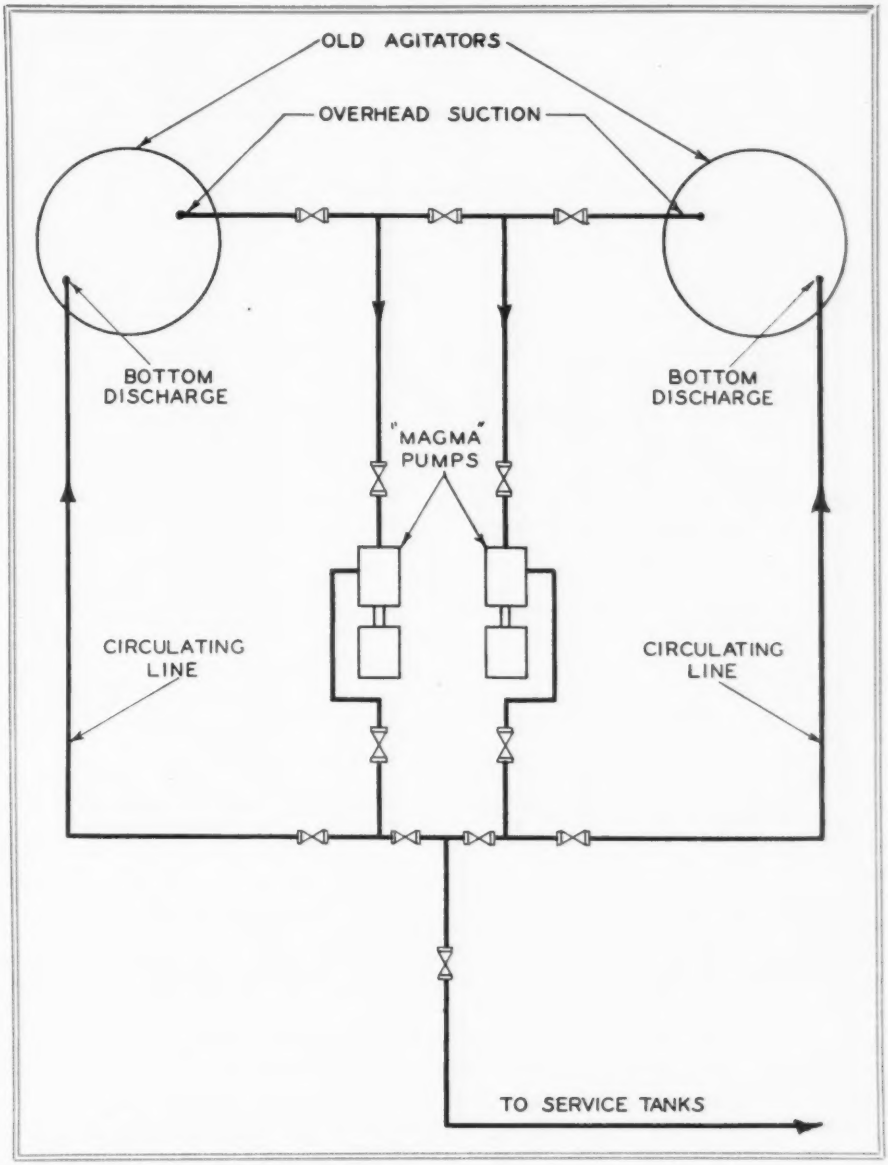

Fig. 3—Successful sludge-blending system now in use in refinery

The greatest problem at that particular refinery is to keep the burner valves and burner tips open, particularly when a fresh batch of the blend is delivered to the fuel tank from the agitators. Ordinarily, the material burned is drawn from a tank, in which the blend is agitated by circulation for at least ten hours.

Fig. 4 shows a schematic arrangement of the storage tanks and the circulating lines.

In some refineries special steam jacketed mixing kettles are used for blending instead of agitators, and mechanical agitation is employed instead of air to mix the blend. To avoid fouling of the suction of the circulating pump with settlings from the sludge being blended, suction is taken overhead while the discharge is made tangentially into the bottom of the kettle. The discharge stream causes rapid circulation around the bottom of the kettle and assists the mechanical agitator in maintaining the sludge particles in suspension.

Because of the more thorough mixing, the blend obtained by this method is much finer than that obtained by mixing in agitators. Additional mixing and homogenizing are obtained in the storage tanks near the fuel consuming units arranged in substantially the same manner as the first installation described.

Instead of "home-made" oil burners, a special adaptation of a standard heavy fuel oil burner is used. The flow through the burner is reversed, that is, the oil is passed through the body of the burner while the atomizing steam is admitted through the oil tube of the burner. The fuel is fired through short carborundum firing tunnels which facilitate the mixing of the air and the fuel and provide incandescent refractory surfaces which act as catalyzers of the combustion reaction. The flames produced from the blended fuel burned as described and the efficiencies obtained on the boilers and cracking unit heater are very similar to those obtained with standard liquid fuels.

Where the quantity of sludge produced is greater than can be used in a good blend of sludge and liquid fuel, the sludge has to be burned "as is," either alone or mixed with

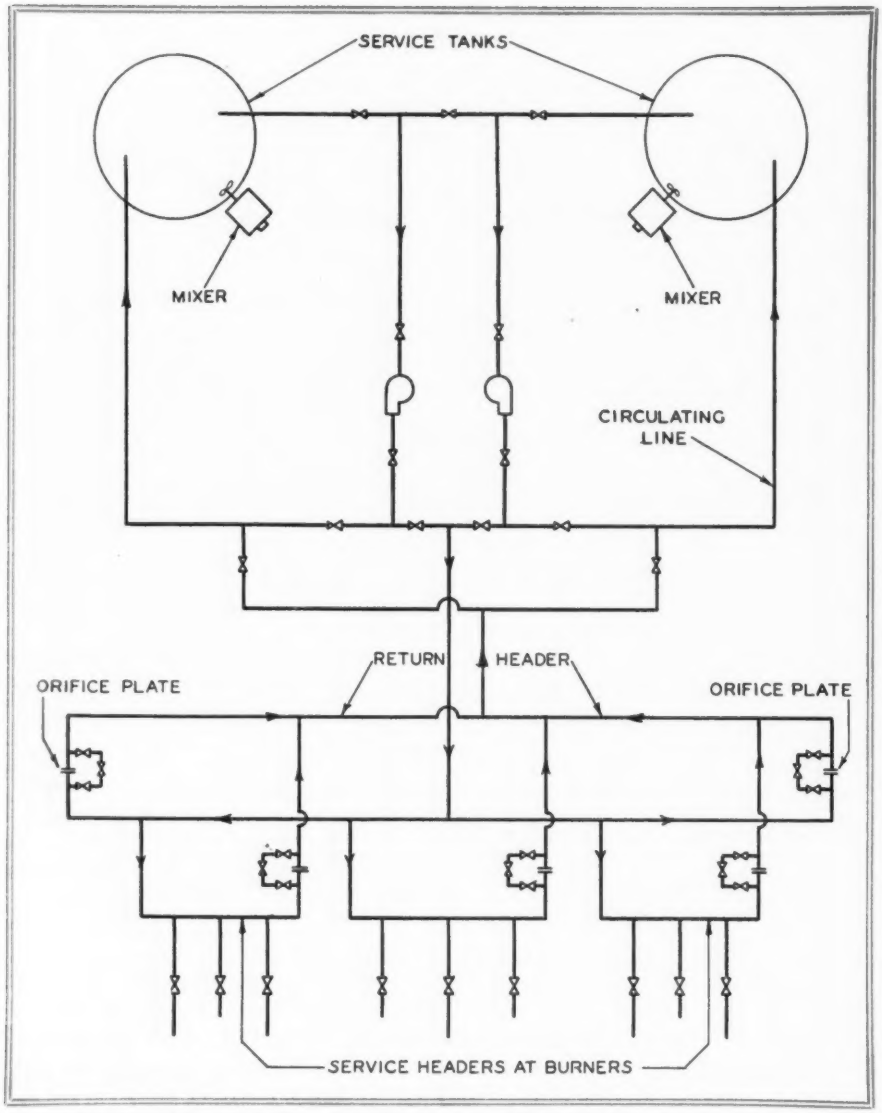

Fig. 4—Storage tanks and circulating lines, sludge-burning system

solid fuels. There are very few, if any, successful installations where sludge is burned in this way either on stationary or chain grates. When used in proportions of more than twenty per cent of the total fuel, the sludge has a tendency to run through the fuel bed and plug the air openings in the grates. With untreated sludge the acid in the sludge corrodes the grates.

A large Mid-Continent refinery has spent a considerable sum of money to adapt their chain grate stokers to burn sludge mixed with either coal or petroleum coke. Specially designed links of cast iron, refractory materials and alloys were tried without success. The sludge either went through the grates or plugged them. The installation of special reflecting arches over the fuel bed to assist in coking the sludge, and rather unique methods of admitting both primary and secondary air have also proved unsuccessful and the company eventually adopted the rotary sludge burner.

The rotary sludge burner is as yet the only successful burner for sludge without preliminary preparation. The burner acts as a coking still and ignition chamber where approximately eighty per cent of combustion is completed. The sludge is kept in constant agitation by the rotation of the burner so that fresh surfaces are constantly exposed to the combustion air admitted into the burner by means of a forced draft fan. To facilitate the agitation produced by the rotation of the burners and to break up any tendency of the coked sludge to bridge over in the burner, high pressure air jets are directed against the surface of the sludge.

Fig. 5 shows general cross sections of the Duncan rotary sludge burner. Table 1 gives the operating results obtained with the burner under large boilers, when over eighty per cent of the load was carried by the sludge burner. The "pilot" gas flames were used mainly for close regulation of steam output by the boiler. The manufacturers of this burner are now offering burners ranging in capacity from six hundred pounds to five thousand pounds per hour.

The operation of rotary sludge burners has brought out a few weaknesses in their original construction, methods of installation and operation. These

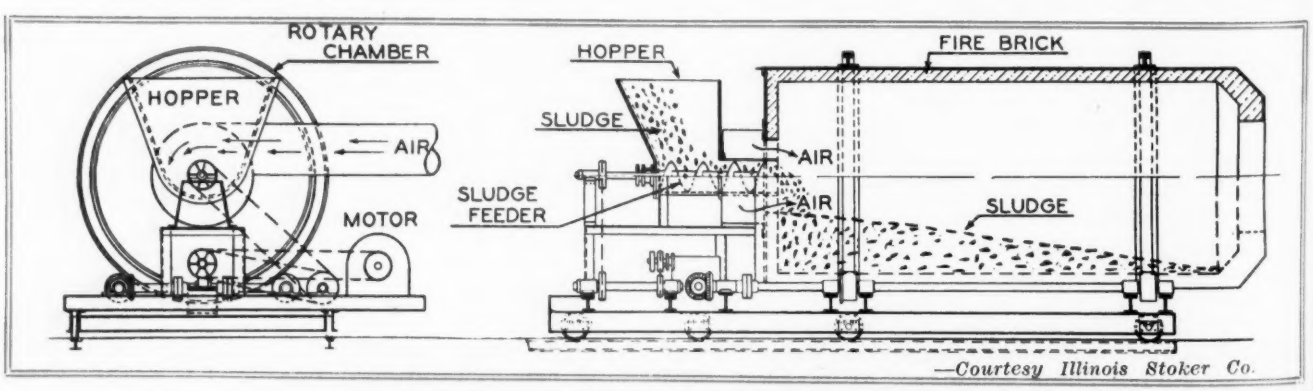

Fig. 5—Cross-sections of Duncan rotary sludge burner

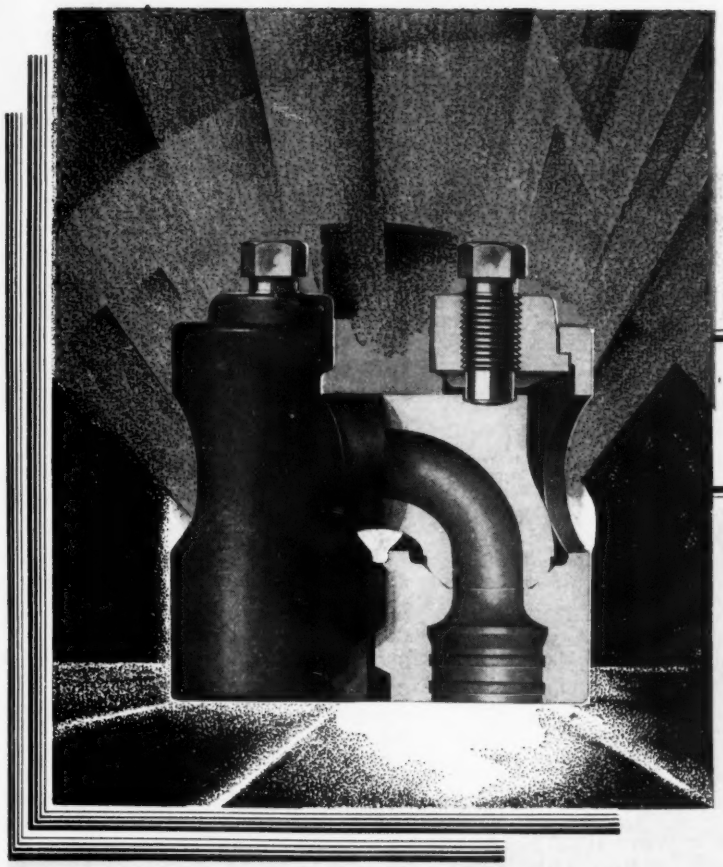

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Table I*

Summary of Two 24-Hour Test Runs

	Separated Sludge from Kettle	Green Sludge from Agitator
Size of Burner	6′ x 15′	6′ x 15′
Boiler—550 h.p.		
Average total rating	203%	199%
Rating due to gas pilot	39	40
Net Rating due to sludge	164	159
Pounds steam from sludge per day	673,607	653,070
Net Btu/lb. steam	1,067	1,067
M. Btu in steam from sludge/day	718,739	693,560
Btu per lb. dry sludge	12,500	13,000
Pounds dry sludge per day	82,000	74,600
Evaporation per lb. dry sludge	8.2 lb.	8.7 lb.
M. Btu from sludge	1,025,000	969,800
Per cent Efficiency	70.2%	71.6%
Tons dry sludge burned per day	41.0	37.3
% Water and Acid in Sludge	40%	20%
Tons wet sludge burned per day	68.3	46.6
Pounds wet sludge burned per hour	5,692	3,884
Flue Gas temperature	587°F.	570°F.
CO_2	11.0%	10.5%
O_2	6.3	7.0
% Air	140	144
Air Temp.	90	90
Furnace draft	0.09	0.09
% Hydrogen in fuel	8%	10%
Pilot flame gas cu. ft./hr.	6,660	6,720
Btu per lb. gas	21,000	21,000
Btu per lb. combined fuel	14,200	14,600
Lb. air per lb. fuel	13.00	13.00
Lb. dry flue gas formed per lb. fuel	13.28	13.1
Total dry flue gas per lb. fuel	18.48	18.8
Lb. water formed per lb. fuel	.72	0.9
Total wet flue gas per lb. fuel	1.12	1.1
	Btu = %	Btu = %
Btu per lb. combined fuel	14,200 = 100	14,600 = 100
Btu loss in Dry Flue gas	2,210 = 15.6	2,160 = 14.8
Btu loss in wet flue gas	1,420 = 10.0	1,390 = 9.5
Btu loss radiation & miscl.	500 = 4.2	500 = 4.1
Btu to steam = eff.	9,970 = 70.2	10,450 = 71.6

*Osborn and Davis, "The Utilization of Heavy Oil Acid Sludge" as presented before the Ninth Annual Meeting, American Petroleum Institute, December, 1928.

weaknesses are gradually being eliminated in the newer designs. The main cause of trouble with the rotary burner, itself, is the burning out of the lining and of the throat of the burner. At one refinery the maintenance of these two items averaged $0.13 per ton of sludge processed. The maintenance of the tires, rollers, and bearings of the burner was, comparatively, a negligible item, amounting to only $0.025 per ton for a period of eighteen months. The maintenance of the brick work of the boiler, particularly of the wall opposite to that through which the burner fires, is another important item. At the same refinery the maintenance expense of furnace walls was greater than the maintenance of the burner itself.

The high maintenance cost of refractories of the burner and boiler setting is probably due not so much to the high temperatures within the burner and the boiler as to the erosion and corrosion of the refractories by the sludge particles and the acid, and particularly by the fluxing with earthy materials admixed with the sludge. At one refinery, where exceedingly high refractory maintenance costs were reported, it was found that oil soaked clay and fuller's earth were dumped into the burner. When this practice was stopped, the refractory replacements were cut in half.

The use of special acid resisting refractories is now being tried out in some refineries and the results reported to date look very promising. With reduced maintenance obtained with the special refractories, the cost of burning a ton of sludge (including all the handling costs of the sludge, the cost of power used by the burner, interest and depreciation) varies between $0.30 and $0.50 per ton, or approximately $0.02 per million B.T.U. generated. The disposal of acid sludge in this manner, therefore, is a well paying proposition and deserves serious consideration by the refiners.

NEW EQUIPMENT

Worthington Pump & Machinery Corp., Harrison, N. J., manufacturer of power plant equipment, describes in a recently published bulletin the Worthington multi-V-drive equipped with a special Goodyear endless V-shaped rubberized cord belts. The multi-V-drive consists of a number of these cord belts running over pulleys or sheaves constructed with corresponding V-shaped grooves. The wedging action of the belts in the pulley grooves provides a grip which transmits power efficiently, the company says.

As a result of this improved grip, short centers without idler pulleys are now practicable, the company says higher pulley ratios can be used; and bearing pressures may be lessened by reducing initial belt tension.

* * *

"The Hump Method for Heat Treatment of Steel," Catalog No. 90 of the Leeds and Northrup Co. covers in a comprehensive manner the latest steps in the method of temperature control in the treatment of steels. The different types of equipment assemblies are discussed, use of the different instruments for control and recording temperatures, furnaces, requirements for producing different materials for various purposes, and the different types of steel products to which the Hump method is applicable. Prices of Hump hardening furnaces and accessories also are included.

* * *

The Brown Instrument Co., Philadelphia, manufacturer of indicating, recording and controlling instruments, has published in its booklet "The Era of Automatic Control" descriptions and illustrations of Brown devices for controlling temperatures in oil refining, as well as in other industries.

It describes various types of equipment for controlling flow, liquid level and pressure. Among such equipment are its "on-off" controls, its three-position controls, two-motor, trend-analyzing, two-point and four-point controls; its continuous chart recording controllers for temperature, pressure, flow, liquid level, speed or per cent CO_2; and control mechanisms in single and two-motor types.

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The Year's Development in Handling Of Tubing Under Pressure

By H. C. Otis*

THE past year has witnessed a decided development in the technique of handling tubing under pressure. A year ago the snubbing of tubing in and out of wells under working pressures of from 1000 pounds upward—wells in some cases with potential capacities of over 70,000 barrels daily and more than 100 million cubic feet open flow—all with no loss of production and with no interruption of feed, was almost unheard of.

Today, while still the work of trained crews—and such it will always be—running in or plugging and snubbing out of strings of tubing in wells such as those mentioned above no longer excite more than passing interest in the Mid-Continent areas. (In Louisiana, where this work was developed, the installing of siphons in the dangerous gas wells in Richland parish for the major companies is covered by long time contracts and is considered a part of the routine field operations.)

In the Yates, Texas, field tapered tubing, sometimes with wall packers or bottom hole packers, is being run in and out of wells, without the loss of a gallon of oil or a thousand feet of gas. In the Panhandle district of Texas, gas wells are being cleaned out through the use of tubing handled under pressure.

In the Oklahoma City field tapered tubing has now been run against pressure in five wells, and a crew is rigging up to tube a sixth. Kansas, too, has been the scene of some of this work. Plans are now being made for the similar tubing of two and probably more of the worlds deepest wells.

The handling of tubing in large volume, high pressure wells is a serious matter. A slight mistake by a member of a drilling crew can usually be remedied at a comparatively small expense. It is seldom that danger to human life is involved. A slight mistake by a member of a crew handling tubing under pressure can,—and p r o b a b l y would — be a far more serious matter. Not only would the expense of remedying probably be far more, but the danger to life itself would certainly be greater. However, the widespread operations mentioned in the preceding paragraph would, it seems, indicate that operators are convinced

*The Southern States Co. Inc., Shreveport, La.

Snubbing a tapered string against 1750 pounds pressure in the Oklahoma City field. The first part of the string was run against this pressure, though it was lowered to 1300 pounds during the latter part of the installation

Pulling a tapered string of tubing in a large oil well in the Yates field of Texas. Note absence of any evidence of leakage of oil or gas

that crews properly trained and properly equipped can be trusted in the tubing of wells counted not only as the most valuable, but also as the most dangerous to be found.

The technique of thus handling tubing, while highly developed as compared to a year ago, is far from being perfected. Volumes, whether oil or gas, have but little bearing on whether or not a particular well can be safely tubed. The well working pressure while the tubing operations are in progress is the limiting element.

While tubing operations have been carried on in a very few instances against higher working pressure, it is doubtful if any tubing control head available today affords a reasonable factor of safety for the handling of tubing against working pressures much in excess of 1500 pounds per square inch. The distinction between working pressures and rock pressures should be emphasized here. Wells with rock pressures far in excess of 1500 pounds can be tubed with a wide margin of safety,—provided the working pressures during the time that tubing is actually being run can be lowered by feeding into the line to a point somewhere in the neighborhood of 1500 pounds or less.

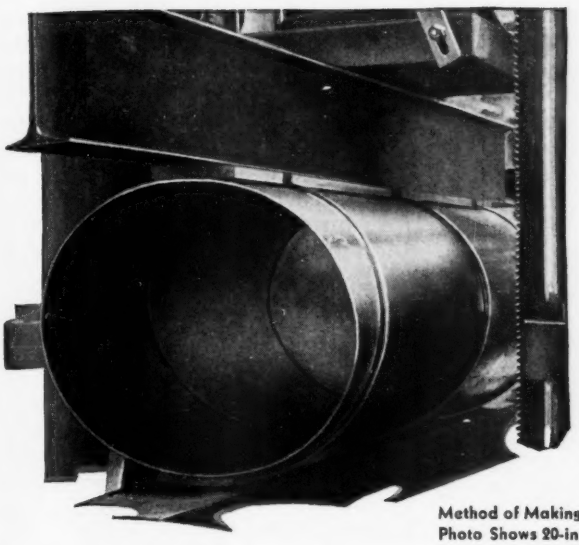
Tubing control heads are built that will safely withstand pressures greater than exist in any of our fields today, so long as the tubing is not in motion. Packing against tubing which is stationary and packing against tubing which is in motion are entirely different matters. In the latter case the comparatively rough surface of even the smoothest tubing available subjects the control head packing, under the higher pressures, to what is obviously a severe abrasive action.

Small leaks which under 1000 pounds pressure are of negligible consequence at 1700 and 1800 pounds quickly cut trenches, rendering the packing useless. Varying sulfur and gasoline content of the oil and gas in different wells assumes apparently far greater importance in wells under the extremely high pressures.

In actual practice, packing which was found to successfully withstand gasoline action in a particular well while under 1400 pounds working pressure, was useless, because of the effect of the gasoline content, when the well working pressure was run up to 1800 pounds. Any by-passing or neutralizing of pressures within a control head which involves even momentary lowering of pressure of the gas aggrivates this condition, since it results in the formation of raw gasoline inside the head itself. Experiments now being conducted however indicate that within another year the safe limit of 1500 pounds working pressure can be raised to possibly 2000 pounds or more.

The ability to safely tube wells under pressure,—and to pack off and raise and lower tubing—is resulting in a good deal of experimenting in the design of flow strings. In the Yates field tubing strings of radically different designs are being tried out successively in the same well. Enough has been learned to indicate that the design of the tubing string is of extreme importance in the matter of controlling gas-oil ratios.

The controlling of back pressures by raising and lowering the tubing string under pressure, while not experimented with as yet to any great extent, will also doubtless be found



Method of Making Crushing Tests.
Photo Shows 20-inch Naylor Pipe.

Authoritative Tests Prove Remarkable Resistance To Crushing Action In LIGHT WEIGHT Naylor Pipe

External crushing tests on Naylor Pipe recently conducted by Professor M. L. Enger and W. M. Lansford at the Materials Testing Laboratory of the University of Illinois show:

Diameter In.	Thickness In.	Load at Yield Point Lb. per Ft.	Vertical Defl. Yield Point In.	Max. Load Lb. per Ft.	Computed Load at Yield Point Without Spiral Joint Lb. per Ft.
6	0.109	4000	0.24	7100	1010
12	0.141	2800	0.45	4200	930
20	0.141	1000	0.45	2000	580

The last column in the table gives the computed load required to stress to the yield point a plain pipe of the same thickness as Naylor Pipe. A comparison of these values with the experimental values obtained on Naylor Pipe brings out clearly the stiffening effect of the Naylor *Spiralweld* lock-seam.

Another feature of Naylor Pipe structure disclosed by these tests is its ability to transmit loads at considerable distances along the length of the pipe due to the flexible *Spiralweld* lock-seam construction. As a result, loads applied to small areas of the pipe would have to reach relatively large values to bring about a collapse of the length which would be affected.

These authoritative tests are indisputable evidence that remarkable resistance to crushing action has always been one of the definite features of *light weight* Naylor Pipe. A fact that Naylor Pipe has demonstrated in the field. Catalog 30-2 gives more complete engineering and metallurgical data.

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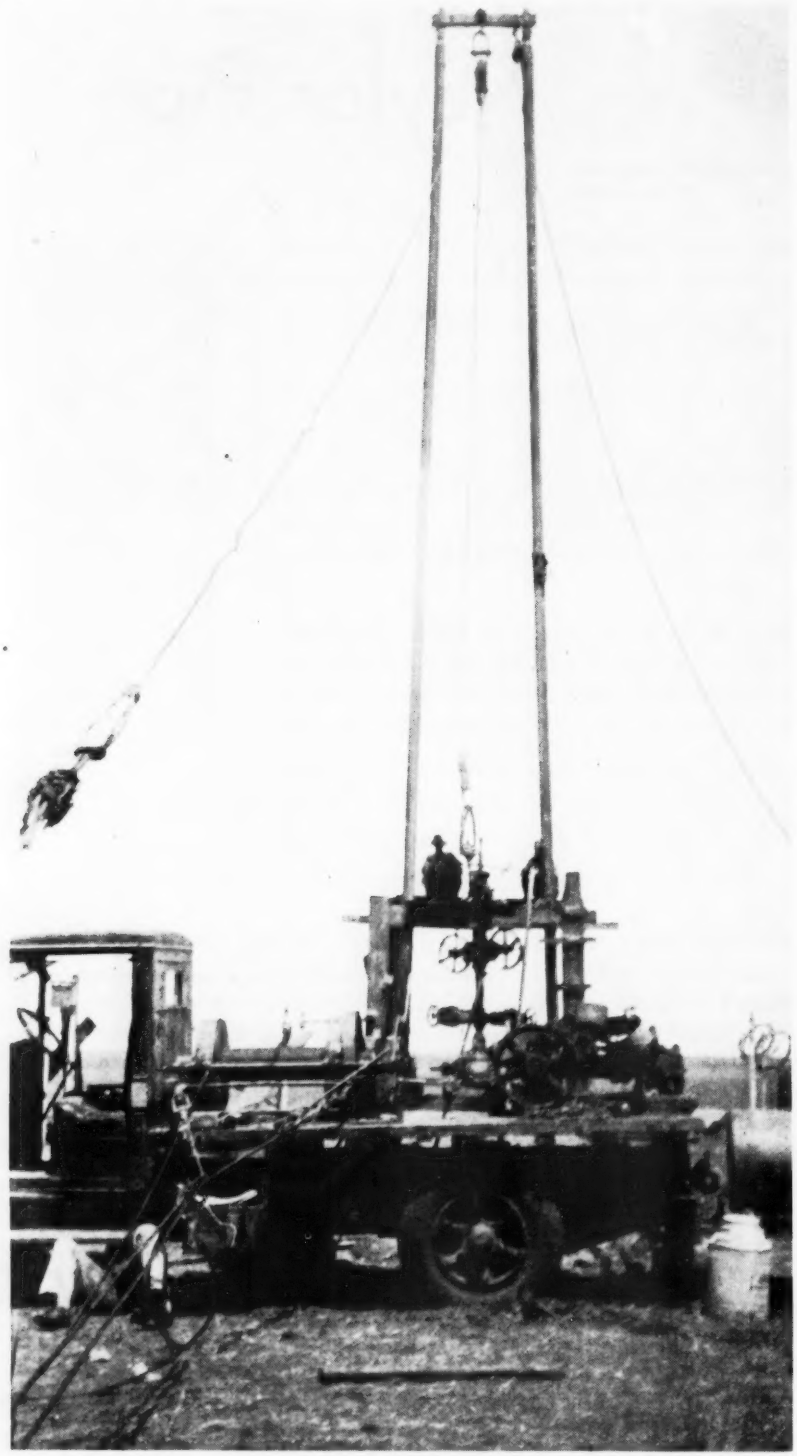
critical within certain limits. It is probable that after more has been learned about the controlling of ratios and of production through tubing design and level, that good practice will call for the bringing in of wells "barefoot," and then after gauging their potential production, for designing and installing against pressure a string of tubing for that particular well. Good practice also may call for the changing of tubing strings to meet changing well conditions.

The handling of pipe under pressure makes possible other operations which formerly have been out of the question without first killing the wells concerned.

The use of packers after a well has been completed is possible under some conditions. Both bottom hole and wall packers have been run against pressure. Ordinarily these can be run more safely with the well completely closed in than when permitted to feed on the line during the installation, though one installation of a standard hook wall packer with an outside diameter of 6¼ inches was recently made a well which was producing 50 barrels per hour through 7-inch casing during the time the packer was being run.



Cleaning out a gas well in the Panhandle, Texas, district by blowing the cavings through 2-inch tubing which has been run under pressure

The purpose of this packer was cut off a small casing leak. Two hundred feet of tubing were run below the packer, and the balance above. A complete shut-off was not secured with the first packer run. Consequently it was decided to pull it and run one of a different type.

When tubing was started out of the well, it was soon evident that the packer had not returned to its open, or running position. Consequently it was necessary to discontinue feeding the well while the pipe was being pulled. The second packer run resulted in a successful shut-off, though because of the almost virgin pressures it was necessary to load behind the packer and to anchor the string in place.

Another interesting operation recently performed is the cleaning of casings out of gas wells by running tubing into them against pressure, by opening the tubing just above the cavings and then by gradually lowering the string as the cavings are blown out through the tubing. The cleaning out of a group of ten wells in the Panhandle district of Texas has just been completed in this manner.

Most of the gas wells in that area have been completed with several hundred feet of open hole. Included in this open hole is considerable bentonite. As long as this formation is kept dry, but little caving takes place. When dampened however it sluffs off rapidly, falling to the bottom of the hole, thus shutting off the producing sands. It has been the practice to feed these wells direct through the casing. The surging, caused by thus feeding the well, of the small amount of

ADVERTISING PAGES REMOVED

View of Foster Wheeler gasoline absorption plant which has a capacity of 100 million cu. ft. of gas per day. The nine absorbers with scrubbers are shown at the right. The fractionating units and stabilizer are to the left of the central aisle. The Foster Wheeler louver type cooling tower and steam generating plant are located in the background.

Gasoline Absorption Plants

The absorption plant illustrated was designed and erected by the Foster Wheeler Corporation. The first unit was completed 39 days from date of contract—and the second unit, 26 days later. This is the shortest time in which any plant of this size has been built. It includes two 50,000,000 cu. ft. units, stabilizers, a complete boiler plant, louver type cooling tower and storage tanks.

Examples of the progressive design employed include internal coolers which are installed in the absorbers and maintain low fat oil base temperatures. This results in increased capacity of the oil to carry gas and lower oil circulation. The turbines are driven by high pressure gas or steam or part steam and part gas, whichever is desired.

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condensed fluid in the bottom of the hole tends to keep the bentonite dampened.

A few wells had been cleaned out with cable tools—permitting the well to blow wide open into the atmosphere during the operation—requiring from a week up to 30 days. Added to the expense of the work itself, to the value of the gas wasted, to the harmful effects of removing the pressure from the sand, is the constant danger of caving on top of the tools.

In cleaning out these wells through tubing, the first step is to run a steel line under pressure to locate the top of the cavings. Then 2-inch tubing, open ended save for a cast iron disc, is snubbed in under pressure and stopped a few feet above the top of the cavings. Three wings are welded onto the bottom collar of the string, making it resemble a three-wing fish tail bit. The cast iron disc is then broken under pressure and the pipe gradually lowered into the cavings.

At other times it would be necessary to pump in a few barrels of water through the tubing. This water would quickly mix with the bentonite, forming a mud which could be easily blown out. Rotating the tubing by hand, through the action of the wings on the bottom collar, insures the cleaning out to full gauge of the hole. In the event the pipe is lowered too rapidly and becomes plugged, a small high pressure water pump connected to the tubing can ordinarily be relied upon to pump the plug back down through and out of the bottom of the tubing.

As much as 150 feet of cavings were cleaned out in some of the wells, two to three days being required for the work of actual cleaning out. Difficulty was experienced in the handling of but one well—in this instance a large boulder had caved into the well and could not be side tracked or drilled up with the tubing. The use of small drill pipe and a light rotary instead of 2-inch tubing rotated by hand could, were such a situation to be frequently encountered, doubtless be successfully used.

The advantages of this method of cleaning out over the cleaning out with standard tools consist not only in a decreased labor charge, but also in the savings of the enormous amounts of gas that are wasted while cleaning out with tools, and in the removal of the necessity of lowering the pressure on the sand.

After cleaning the cavings from the well, the tubing is left swinging, to be used as a flow string and siphon. It is thought that the withdrawing of the well's production through the tubing instead of through the casing will stop the surging action which under the latter method of operation continually washes the bentonite, and that in this way caving will be virtually stopped.

Another operation rendered less dangerous is the running in drill stem under pressure to kill and deepen wells. Recently a well in the Van area of Texas only partially drilled in, and with the drill stem out of the hole, started to blow itself in. The gate valve was quickly closed and an attempt made to kill the well by pumping against pressure at the surface. These attempts were however unsuccessful.

A high pressure tubing crew was hurriedly sent for, the drill stem snubbed in under pressure, and the well easily killed by pumping to bottom. Plans are being made for the reverse operation,—for plugging and pulling the drill stem out of a group of completed wells,—wells which blew in before the drill stem was removed from the hole.

During the past 12 months the contracting company which developed the handling of tubing under pressure has tubed slightly over 200 wells in the Mid-Continent area. Of these 45 were in Oklahoma, 72 in Texas, 85 in Louisiana, and two in Kansas. The wells have ranged from the shallow wells of West Texas to the deep wells in Oklahoma City, and from working pressures of a few hundred pounds up to working pressures above 1500 pounds. Surely this would indicate that the handling of tubing under pressure is passing the experimental stage,—that it is becoming an accepted part of field operations.

Airplane view of Coyote Hills field near Whittier, Calif.

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Fifteen Thousand-Foot Wells---What Will Be Required to Drill Them?

By W. H. Jeffery*

IT WILL be observed that the caption to this article is a question. It follows, therefore, that this attempt at an answer should be accepted for what it is: Just the opinion of one man on the subject. For assuredly the best engineer or the most experienced drilling superintendent would have an exceedingly difficult job if he attempted to make a specification for a suitable drilling outfit to drill to a depth of 15,000 feet. But the writer was asked to do practically this, so what follows is offered with due apologies to the manufacturers and the users of the equipment available today.

Six years ago a well 5500 feet in depth was considered a very deep hole. Three years ago 7500 feet was about the maximum depth to which wells could be drilled with the equipment then available. Today oil is being produced from depths of around 8500 feet and several exploratory holes have reached depths exceeding 9000 feet, one, the Standard Oil Co. of California well near Taft, California, having reached a depth of 9950 feet. So we may regard the 10,000-foot well as having arrived.

Thus, during a period of six years the possibilities of depth in rotary drilling have nearly doubled. Is it, therefore, out of reason to assume that during the succeeding six years we shall not have achieved the 15,000-foot well? The writer for one thinks not.

There has been vast improvement in rotary drilling equipment during the past seven years. Compare the boilers for working pressures of 300 to 350 pounds of today with those for 125 to 175 pounds of steam of seven years ago. At that time the 122-foot derrick was considered a tall one. Today we have the 175-foot derrick.

Five years ago the grades B, C and D of casing and drill pipe had not made their appearance, and alloy steel and heat treated pipe are only recent developments. The rotaries, draw works, slush pumps and swivels used to drill the 5000-foot wells of seven years ago are dwarfed by their massive roller bearing successors of today.

That old equipment that well served the purpose of those not so remote days would not be used today to drill a 300-foot hole. The hydraulic rotaries, steel rotary hose, rubber drill pipe protectors and weight indicating gauges were unknown five years ago. It follows that any prophecy of what the equipment will be five years hence can be little more than a conjecture.

But what kind of derrick, drilling outfit, prime movers, etc., will be required to do this 15,000-foot drilling? The first questions that obtrude are:

First, how about handling 15,000 feet of drill pipe and nearly as long a string of casing, the former weighing perhaps 400,000 pounds and the latter from 350,000 to 550,000 pounds?

Second, how shall the derrick be built to provide for the set backs of all this drill pipe and casing?

In the writer's opinion the 170-foot derrick has about reached the limit in height and for future deeper drilling the derricks will have to be re-designed with both larger base and crown dimensions, thus providing for more space for pipe to be stacked without increasing the height.

For such deep drilling and for handling the necessary long strings of pipe the uneconomical steam boilers, engines and slush pumps in use today will doubtless have to give way for Diesel engines, gas engines, and electricity. These types of prime movers all are so much more economical than steam that about the only place for the latter will be in the use of modern return tube or water tube boilers with turbine engine direct connected to electric generators—in other words the drilling of a 15,000-foot well will require modern electric power plant equipment, perhaps of special design to permit of portability.

In localities where electric power may be both available and cheap, it probably would be more economical to use it than to provide such a power plant. The saving in fuel and water cost in the drilling of one such well as between steam and one of the other sources of power could amount to as much as $25,000.

With regard to handling the long and heavy strings of drill pipe and casing for a 15,000-foot well, we are now employing cumbersome equipment such as massive crown blocks and 76-inch traveling blocks using 12 lines and 10-inch diameter hooks. This number of lines means very slow motion and if we increase the number to 14 or 16 we correspondingly slow up the operation of making a round trip with the drill pipe and of putting in the casings.

Also we should have to use 1⅜ or 1½-inch diameter wire lines which would necessitate larger sheaves in both crown and traveling block. These sheaves are 48 inches in diameter now, but an increase to say 60 inches, the minimum recommended for 1⅜-inch rope would

*The W. H. Jeffery Co., Toledo, Ohio.

require a traveling block about 90 inches long.

It seems to this writer that the hydraulic system may well be employed to take the place of all this equipment. A heavy rotary table designed on the lines of the Hydril or the Sheldon-Burdon outfit, but with hydraulic cylinders having a lift of 20 to 25 feet would hold the long strings of pipe safely and raise and lower them without the use of the crown and traveling block, hook and elevator. The 20 to 25-foot travel of the hydraulic cylinder would handle one length of casing or drill pipe with tool joint.

As the only hoisting necessary with such an outfit would be for setting in one or two lengths of pipe as they are added to the string, the lightest draw works, lines, blocks, hook, etc., would answer. A heavy spider with slips could be set in the cellar to hold the casing while the hydraulic table was moved up or down.

The question here will be raised, "What about handling a fishing string of pipe when fishing for lost bits, twisted off pipe, etc?" The hydraulic cylinders would lower or raise the fishing string and handle a fishing job just as efficiently as it is done with the present equipment. A well-known California operator, Charles W. Sulzer, suggested to the writer that a hydraulic cylinder arrangement could be devised to use with the drill stem to raise and lower the string or pipe, taking the place of the Hydril type hydraulic rotary.

There is another reason why the type of equipment in use today might prove inadequate for 15,000-foot holes and that is the extreme pressures that will have to be dealt with at such depths. Based upon a normal ratio of lift it is reasonable to expect pressures of around 6000 pounds per square inch at 15,000 feet. The results of a blowout at any such pressure can better be imagined than described.

It has been found impossible to finish many of the wells in the Turner Valley, Alberta field at depths of 5000 to 6000 feet with either rotary or cable outfits due to the excessive pressures, but diamond drill outfits using the hydraulic principle have succesfully completed some of the wells. These outfits, by means of their pipe or rod brakes are able to hold the pipe in the well against high pressures where it would be blown out with a rotary outfit, or cable tools would be blown from the hole.

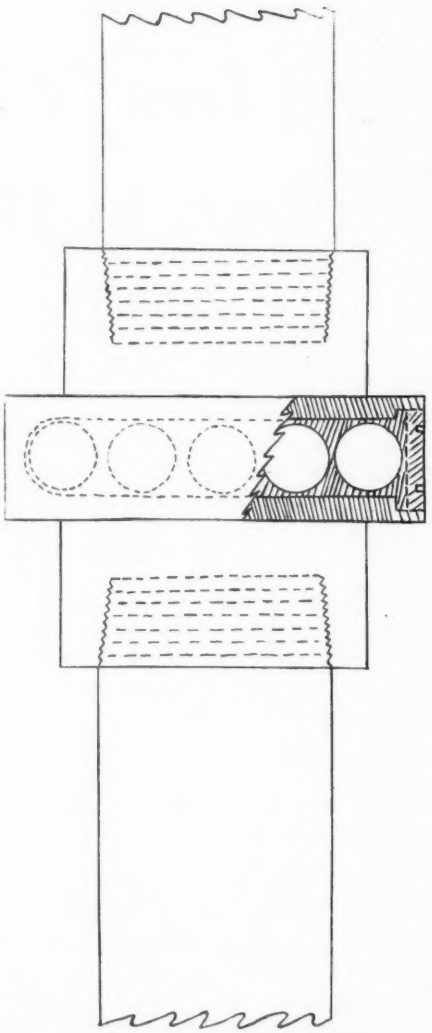


Fig. 1—Suggested ball bearing protector for drill pipe

We now come to the question of the casing for such a well. Based on present casing programs in the various fields of California a casing program for a 15,000-foot well would look something like this:

Length of String, Ft.	Size, Inches	Weight, Pounds	Kind	Safe Length of String Against Collapse, Safety Factor 2. Feet
500 to 750	30		Stove Pipe	
800 to 1,500	24½	113.	All	354
4,000 to 5,000	18⅝	96.5	Seamless	1200
6,000 to 7,500	13⅜	68.	Grade D	2756
8,000 to 9,000	9	45.	95,000 Lbs.	5569
10,500 to 12,000	6⅝	28.	Tensile	7037
13,000 to 15,000	4¾	16.25	Strength	8300

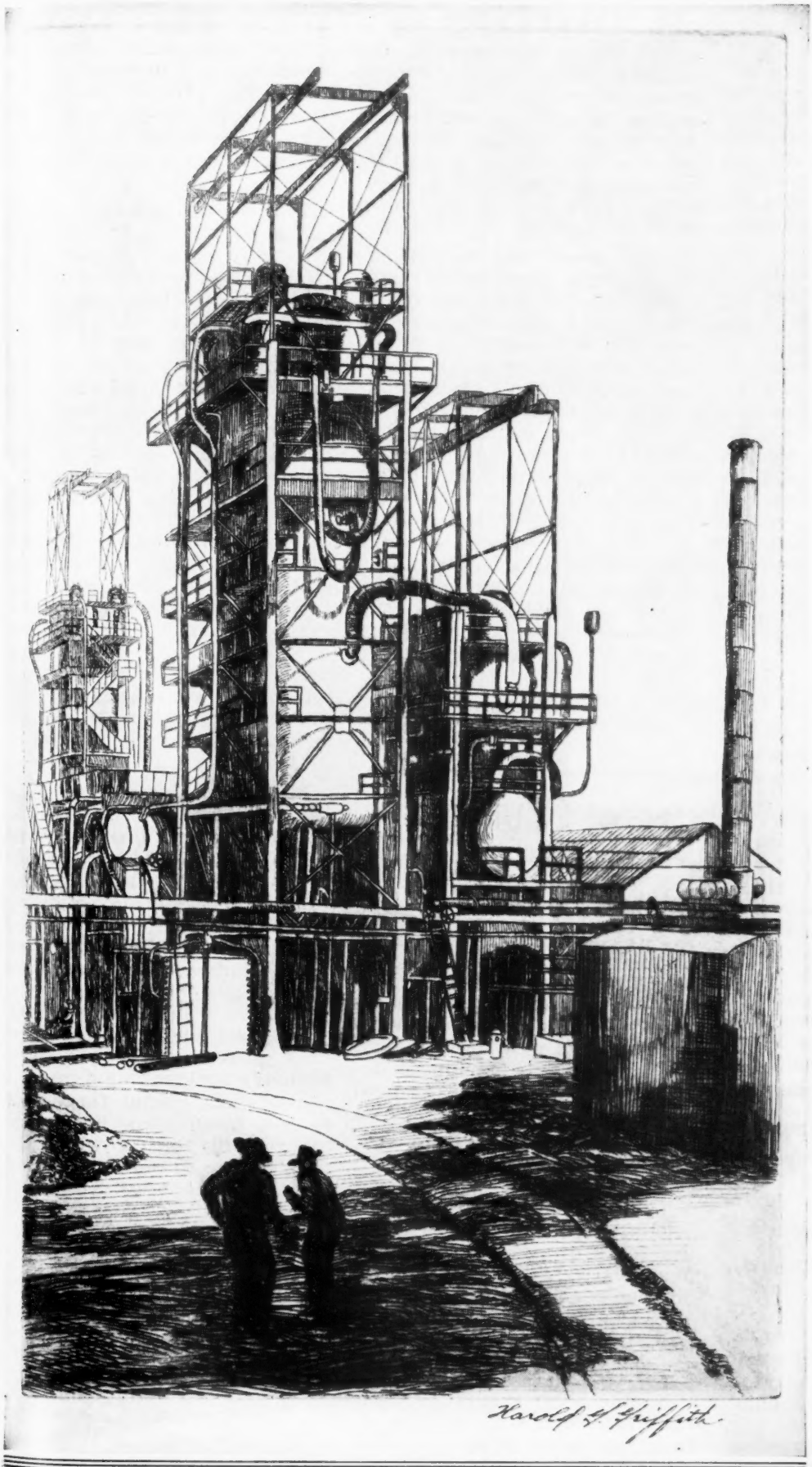
From the above it is quite apparent that the pipe manufacturers will have to make some heavier and stronger casing if the 15,000-foot well is to become a reality. Even eliminating the safety factor it would be unsafe to use the necessary lengths of the three larger sizes, for these strings are beyond the collapsing strength of the casing.

In drilling at depths around 15,000 feet the torsional stress on the drill pipe would probably be too great for the drill pipe available today, good as the grade E alloy steel heat treated pipe undoubtedly is. This problem might be solved by the use of the new Russian turbo bit, by means of which the bit is rotated by hydraulic power using the mud fluid and the pipe remains stationary. Or possibly a rotary impact bit may be developed to combine the rotary and cable bit features, the impact to be secured by means of the mud fluid, as with the turbo bit, or by the use of high pressure gas or air, on the principle of the well-known air rock drills.

If the pipe is to be rotated at such depths then it would seem that some means must be provided to relieve the torsional stress. Perhaps ball bearing or swivel protectors set in the string of pipe at intervals of 100 to 500 feet might relieve such stress. When the protectors bear against the wall of the hole the pipe would swivel inside them. Refer to Fig. 1.

If the drill pipe is to be held by the draw works for such deep drilling then draw works brakes more powerful and sure than the present manually operated brakes must be provided. Hydraulic, air, or water brakes could be designed to care for this.

We come now to the type of slush pump that will be required to circulate mud fluid in



Courtesy of The Guardian Trust Co., Cleveland, Ohio.

MODERN BUBBLE TOWERS at the Standard Oil Company (Ohio) operating with OCECO One Piece Cast Iron Trays and OCECO Bubble Caps in connection with 1000 pound cracking unit.

These OCECO towers produce direct from the cracking unit, gasoline which requires no re-running and no acid treatment. The Oil Conservation Engineering Co., 877 Addison Road, Cleveland, Ohio.

a 15,000-foot hole. It would, of course, have to have a powerful water end, capable of putting up a pressure of 4000 pounds or more. Cast iron will not answer for this pump. Its water cylinders will probably have to be bored out of solid forgings and the pistons and valves will also have to be forged. The steam end could probably be cast from alloy steel. One make of slush pumps bears the trade name "Mud Hog." This pump might be called "Mud Hippo."

The "bringing in" of a big oil or gas well at a depth of 15,000 feet presents an interesting problem. We have seen the havoc wrought by the blow-outs of the Continental Oil Co. Elliott 12-8 well at Kettleman Hills from a depth around 7500 feet and of the Indian Territory Illuminating Oil Co. Mary Sudik No. 1 well at Oklahoma City from a depth of about 6500 feet.

Then imagine if you can the blow-out of a wild well from a depth of 15,000 feet where the pressure might be more than 6000 pounds per square inch. The blowout preventer and Christmas tree valves and fittings would have to withstand a test pressure of 12,000 pounds per square inch for them to be safe to use on such a well. All such valves and fittings would have to be forged from a special alloy steel, of prehaps, chrome, vanadium and other alloys that would add strength and toughness to the forgings. The casing and tubing in such a well would have to be heavier or made of steel of some such alloy to prevent it from bursting under the high pressure.

A gas operated pumping jack has just made its appearance in California to operate on gas at 90 pounds pressure. Twin cylinders that look like a cross between a twin steam engine and hydraulic cylinders raise and lower the sucker rods by gas pressure assisted by auxiliary oil cylinders to counterbalance the load.

This jack and the modern two stage gas separation, delivering high pressure gas to the gasoline plant at 150 to 500 pounds pressure, thus utilizing the high pressure of the gas to same compression, open up interesting possibilities for the utilization of high pressure gas, much of it wasted into atmosphere today, as a source of power for drilling.

The writer, in observing the massive control heads, master gates, forged steel fittings and anchor rods, chains and clamps used to hold this gas in leash, believes that here is a vast source of power in our deep oil fields which has not yet been fully utilized.

Thirty years ago natural gas was used in steam engines for drilling in the gas fields of Indiana, but it was exhausted to atmosphere the same as steam, which was dangerous. It would seem that some of the surplus high pressure gas from the modern deep wells could be used to drive the engines, and the slush pumps, displacing boiler or reducing the boiler requirements. This gas could be taken from the high pressure separators, run through the engines and slush pumps, then exhausted into the low pressure separators, or direct to the gasoline plant, or used for repressuring.

Note: All rights are reserved by the author to any new ideas or equipment suggested in this article.

NEW EQUIPMENT

The Merco Centrifugal Separator Co., 343 Sansome St., San Francisco, a subsidiary of The Merrill Co. and allied with the Merco Nordstrom Valve Co., describes its centrifugal separator for desanding rotary drilling mud in a new bulletin just published. This machine is designed for use in central mud treating plants. Its capacity is 10,000 barrels per day, permitting desanding rotary mud from several wells.

The centrifugal develops a settling force equal to 67 times the force of gravity, the company claims. It requires a 10 horsepower motor to operate it.

The bulletin also contains sieve tests on the treated mud.

* * *

Naylor Pipe Co., 1230 East 92nd St., Chicago, describes, illustrates and presents engineering data in a newly published 43-page booklet on Naylor line pipe for oil, gas, refinery, sludge, tank swing and tank gauge lines and for various other uses.

The engineering data includes tests of physical properties of the pipe, including hydrostatic pressure tests, cross bending, crushing longitudinal tension and compression tests.

* * *

Link-Belt Co., 910 S. Michigan Ave., Chicago, has prepared a bulletin on the proper lubrication of rotary sprocket chains. According to Charles R. Weiss, chief engineer who prepared the statement, the oil should not be merely poured from the can to the back of the chain while the chain in running at high speed because the centrifugal force throws the oil outward and little will reach the bearing surfaces of the chain joints.

For best results the inside of the chain should be brushed with a wide brush saturated with good lubricating oil. The chain should be run slowly while brushing the oil on. From here the centrifugal force throws it outward, penetrating the bearing surfaces which the oil-covered chain must pass.

* * *

Merco Nordstrom Valve Co., San Francisco, has developed a new type of flanged joint designed for use with welded pipelines where such a joint is required for the insertion of valves and fittings for taking off outlets. It is called the Merco swivel flange. Its main advantage is its flexibility, having equally as much as the ordinary Vanstone type, the company says, plus the strength of an ordinary butt welded flange. It consists of a drop forge steel flange, fitted to a drop forge tapered nipple on which the flange may be rotated, permitting alignment of bolts, etc. Sizes from 1½ inches to 10 inches will be made soon.

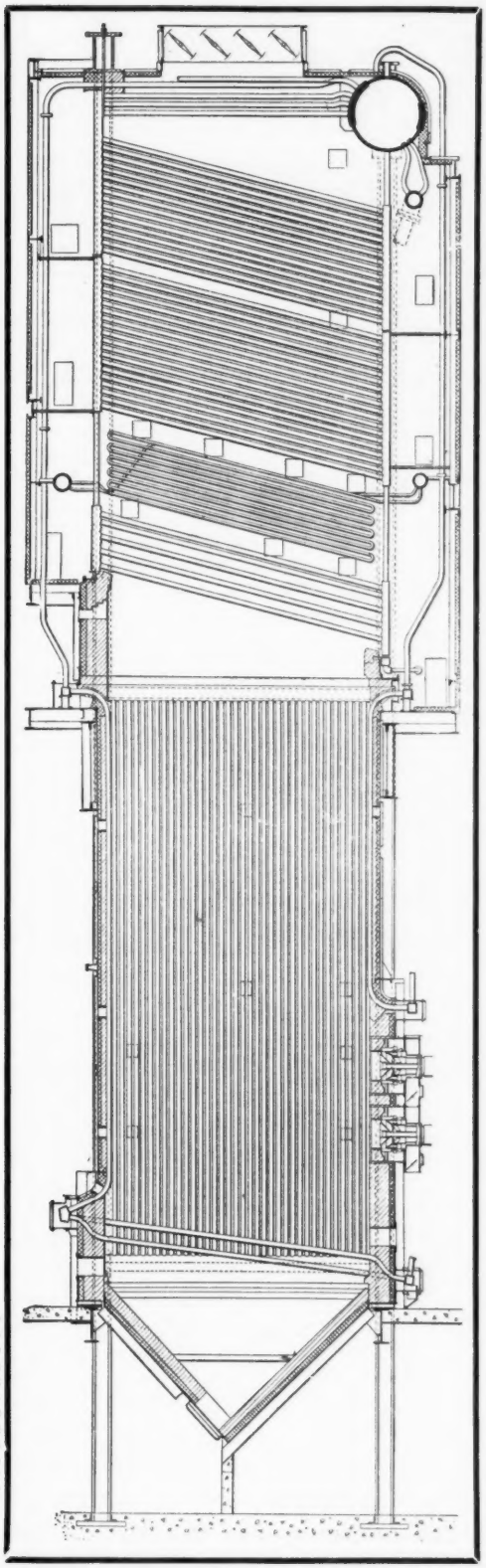
* * *

Chicago Pneumatic Tool Co., New York, has appointed W. J. Nutto manager of the Mid-Continent division of oil tool sales with headquarters at No. 1 West 16th St., Oklahoma City.

* * *

Merco Nordstrom Valve Co., San Francisco, has opened an office at Charleston, W. Va., in charge of H. D. Ruos.

One Walsh-Weidner Forged Steel Sectional Header Boiler *to serve a* 25,000 kw. Generator



Sectional elevation of the Combustion Engineering steam generating unit now under construction at the Duluth Steam Electric Station of the Minnesota Power & Light Company

The Walsh-Weidner sectional header boiler to be installed at the Duluth Steam Electric Station of the Minnesota Power & Light Company is believed to be the largest sectional header boiler ever built.

This Walsh-Weidner forged steel sectional header boiler contains 36,300 sq. ft. of heating surface; is of single pass design, 38 sections wide and 43 tubes high, including 3 rows of circulators. The steam pressure is 485 lb. per sq. in. with a total steam temperature of 760 deg. fahr.

The furnace is composed of four water-cooled walls of the C-E Fin Furnace type and pulverized fuel is introduced through six Lopulco horizontal burners.

This installation is an excellent example of the rapidly growing trend of—one boiler per generator.

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BOILERS - AIR PREHEATERS - STOKERS - PULVERIZED FUEL EQUIPMENT - WATER-COOLED FURNACES

Operation of Water Flood Properties Under Proration Schedules

By Paul D. Torrey*

OWING to various economic factors and to the ease with which oil production may be maintained or increased by water flooding, the Bradford and Allegany fields have been confronted, during the greater part of this year, with a much larger available and potential supply of crude than market conditions could absorb.

This situation has required radical changes in operating technology in order to maintain a pro-rated production. Conditions are, of course, most variable over the entire areas of these fields and it would be almost impossible to outline methods of procedure that could be advantageously applied to every property. There are, however, certain fundamental principles which should be adhered to and which may, of course, be modified to meet specific conditions.

One of the first suggestions of certain operators, as a means of curtailing production, was the shutting down of water pressure plants.

Under certain circumstances this might be done with no ill effect upon ultimate recovery but in the majority of cases the shutting off of the water supply would most certainly jeopardize, not only the possibility of obtaining the return of capital invested but also of any profits which might be anticipated under more favorable market conditions in the future.

It is almost needless to state that this method was not favorably received by the operators who had carefully analyzed their own individual problems.

It should be appreciated that at the time pro-ration was started almost every operator had floods in all stages of depletion. There were floods which were approaching the economic limits of production; some were still producing considerable oil and large volumes of water; others would be reaching their peak of oil production with little water as yet coming into the oil wells; and, there were, of course, floods in which drilling was still in progress or nearing completion.

WITH the introduction of proration measures into the Bradford-Allegany district of Pennsylvania and New York, considerable change was necessitated in the operating methods.

In this district water flooding of the producing sand is practiced on an extensive scale and has been responsible for a great increase in the output of the district.

Mr. Torrey, who has devoted the past six years to problems of the Bradford-Allegany field, tells here of the modification in practice brought about by proration.

In floods that are approaching the economic limits of production under average price conditions, proration presents a real problem.

In many cases the margin of profit even under normal circumstances is small and to reduce the production to the proportions required under the proration agreement would necessitate the operation of the flood at a material loss for, unfortunately, production costs cannot be reduced in proportion to the amount of oil produced.

Floods in this state of depletion should certainly not be curtailed for it is very questionable whether the oil available at the time that pro-ration went into effect can ever be entirely recovered at some future time if pumping is partially or totally discontinued.

It is rather infeasible to back-pressure wells in floods of this character so it therefore seems advisable to pump them to the limits of their economic production without regard to specifications and to more severely prorate other properties or areas where the floods have not reached such an advanced stage.

Returning Oil to Hole

In floods that are still producing considerable oil but are approaching the economic limit of production owing to the rapid encroachment of water a combination of back-pressuring and pumping is advisable. By this method pumping is not discontinued.

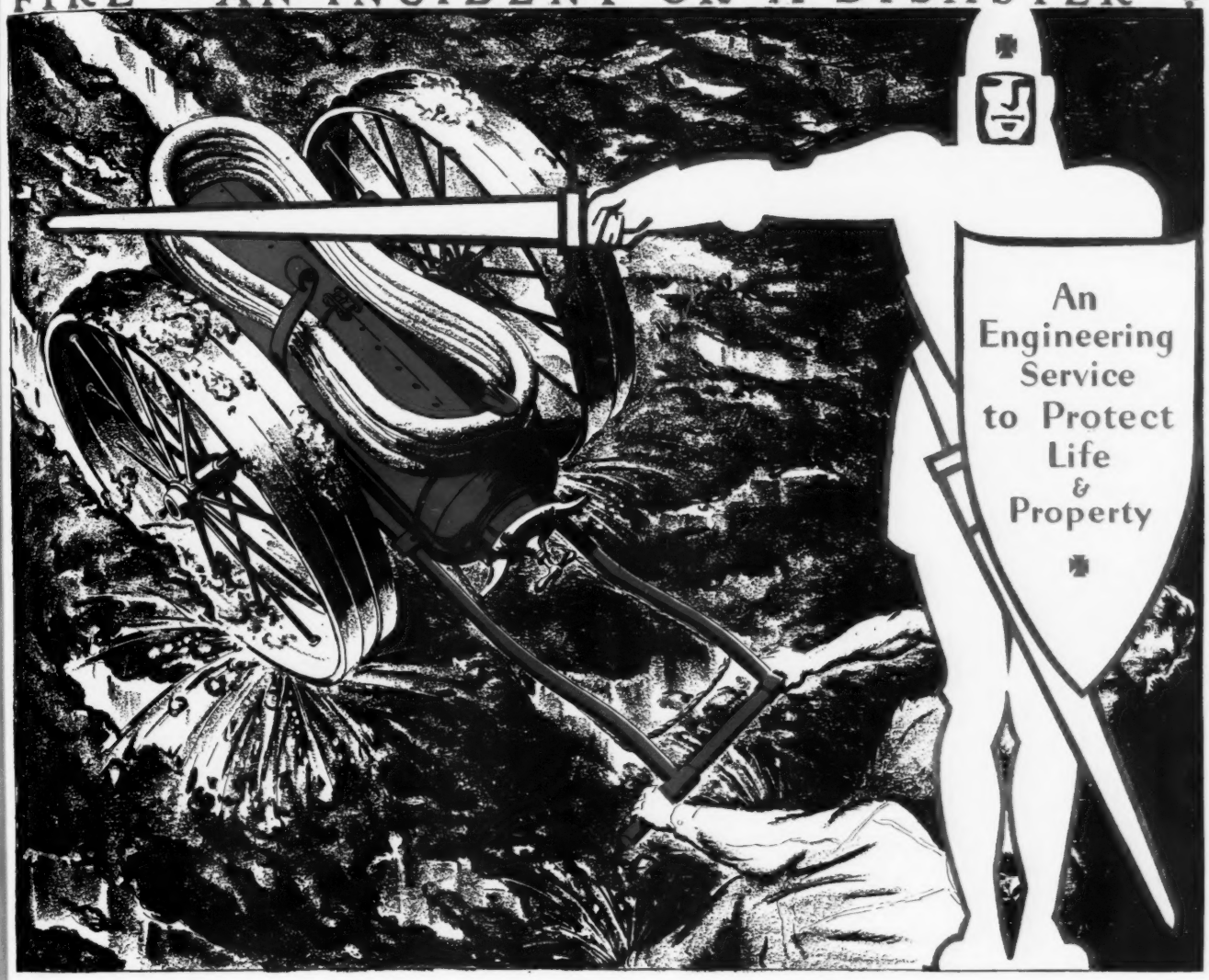
All oil in excess of the prorated amount is returned into the hole from the separator tank and as the column of fluid rises in the hole a condition of partial equilibrium between the water intake well and the producing well is established. Since the water coming into the producing oil well accumulates in the bottom of the hole it can be easily removed so that eventually the amount of water produced is very small due to the back-pressure exerted by the column of oil above it.

By systematically removing the water the danger of back-flooding in undepleted parts of the sand is obviated.

Before attempting a combination of pumping and back-pressuring the operator should be certain that there are no porous horizons between the bot-

*Torrey, Fralich & Simmons, geologists and petroleum engineers; Bradford, Pa.

FIRE — AN INCIDENT OR A DISASTER ?



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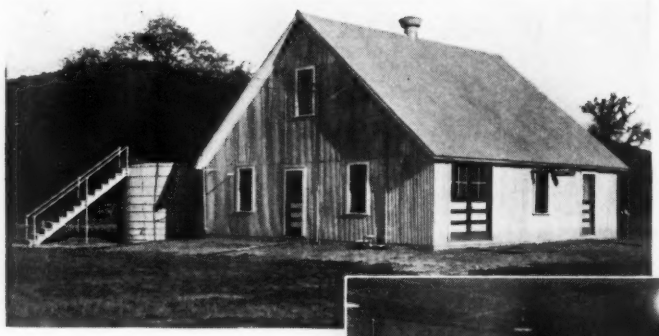
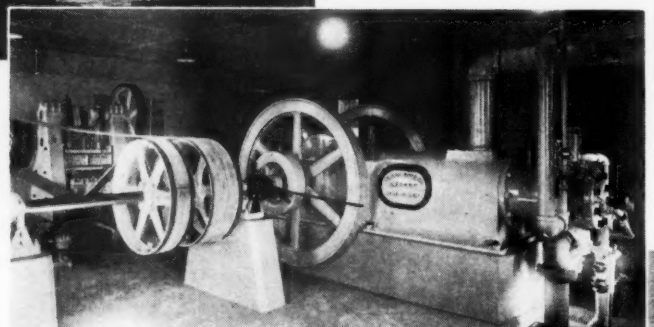
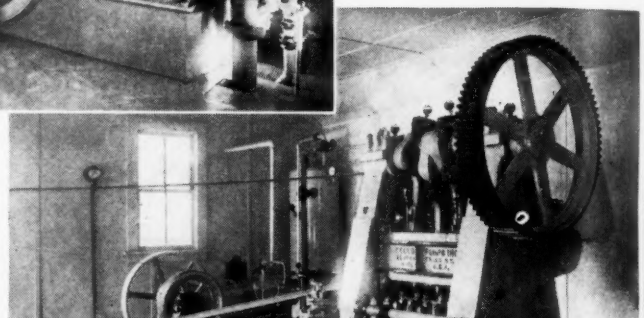




A modern water pressure plant recently installed in the Bradford field



tom of the casing and the top of the producing oil sand that might absorb oil that has accumulated in the hole.

The existence of such beds may not be recognized in ordinary drilling operations and where they are suspected it would be desirable to determine their character by coring in order that oil may not be forced into beds from which it probably never could be recovered.

In general, however, the rocks below the surface water bearing beds and above the oil sand are impervious and in reality there is little danger of leakage of oil into other beds.

The most effective and in reality the only method by which the anticipated ultimate recovery may be obtained from floods operating under pro-ration schedules that are approaching or have reached their peak of oil production is by back-pressuring.

Under this system of operation a normal water input is maintained into each intake well and the pressure at the top of the sand periodically increased as the sand body within the five-spot square becomes more nearly saturated with fluid.

Since little water is ordinarily coming into the producing oil wells during the earlier stages of flooding action there is no danger of back-floods due to the accumulation of water in the bottom of the hole.

As the sand body nears the point of effective fluid saturation the oil is concentrated in the center of the five spot square and rises in the hole of the producing oil well exerting a back-pressure on the oil sand.

As soon as oil begins to rise in the hole it is desirable to close all gas lines and lead lines since as soon as a condition of equilibrium is established between the water intake wells and the oil wells the oil will flow in a volume dependent upon the pressure applied at the intake well.

The system of back-pressure and flowing has been used with great success on several properties. It was originally tried under the writer's general supervision as a substitute for the delayed system of drilling oil wells and subsequently, particularly in the Allegany fields, it has been used to great advantage as a means of controlling production. A most desirable reduction in operating costs is effected by the use of this method since pumping is not required and in addition it tends to conserve the available supply of gas.

Promotes Uniformity

Back-pressuring and flowing in principle approaches the beneficial effects that have been obtained from delayed drilling. The use of this method will unquestionably force a more uniform flooding action throughout the sand body which combined with the apparent economies of operation which it affords makes it the most desirable method known to the writer for controlling oil production.

As soon as the required amount of oil is produced on any day, the wells are shut-in and the pressure allowed to build up again at the casing head.

One of the most interesting features connected with back pressuring and flowing is that it is possible to almost equal the pressure carried on the pumps at the casing head. The differential ordinarily does not amount to more than five per cent. However, as the oil well is flowed the pressure built up at the casing head rapidly declines.

It can be readily appreciated that as soon as the sand body becomes reasonably well saturated with fluid and if a continual outlet is not provided there is a very appreciable decline in water input since there is, in reality, no place for the water to go within the confines of the five-spot square.

As long as the outlet is closed the energy available at the oil well is used to build up pressure in the sand and in the oil accumulated in the hole accord-

ing to the principles of Pascal's Law.

As soon as the outlet is opened and fluid movement occurs in the well and in the sand body, the rapid decline in pressure previously referred to can only be expected owing to the work done in overcoming the frictional resistance to fluid movement in the fine pore spaces of the sand, and in replacing the oil removed with water.

Back-pressuring and flowing place water flooding for the first time under true hydraulic control since the movement of fluid in the sand body must depend almost entirely upon hydraulic replacement rather than upon capillary displacement. In other words, as the oil is removed from the sand the voids it formerly occupied are immediately filled with water.

Capital Return Delayed

Pro-ration schedules accompanied by a lower than average price for crude have materially affected the possibilities of return that were anticipated from many properties.

Large capital investments are required for water-flooding developments, but previous rapid return of the money invested made this system more nearly approach a manufacturing business than the industry of oil production in any other part of the world.

Since the return of capital will be much longer delayed under existing conditions with a consequent increase in interest charges, the continuation of profitable operation is dependant upon either a reduction of operating expenses or upon an increase in ultimate recovery.

The limits to which production costs may be reduced, without seriously affecting the efficiency of operations, can be rather definitely established and unfortunately for many producers expenses cannot be curtailed in direct proportion to diminished output.

In general, all expenses which may be capitalized can readily be avoided since practically all development work has been abandoned, but it is obvious that a developed property which has a large present or potential production requires approximately the same number of men regardless of whether it is producing all or only part of the oil available.

It might be stated to the credit of the operators of the Bradford and Allegany fields that although many employees have been laid off, there has been no trend toward a general reduction in the scale of wages and that the majority of men out of work at the present time are drillers and tool-dressers who migrated from other fields during the time that development activity was at its height.

Economies of operation which can be readily effected consist of studies of the rate of depreciation of various oil-field equipment, in the care and better handling of the crude produced and in the utilization of improved production methods such as back-pressuring and flowing, which have been previously referred to.

Some very worth-while and eventually profitable engineering investigations have been conducted by several companies to determine the comparative efficiency and life of such articles of oil-field equipment as meters, small vertical air compressors, centrifugal pumps, belting, etc.

Studies of this character if properly guided by competent engineering advice rather than by the personal prejudice of pumpers and lease-foremen are very desirable and will unquestionably repay the original effort and expense involved.

The investigation on the proper handling and prevention of evaporation of crude oil which the writer made under the auspices of the Northwestern Oil Producers Association has yielded very gratifying results.

The savings on the properties which were originally studied have alone amounted to approximately 200 barrels of oil per day, and although it is realized that this improvement has not been universal, it is almost needless to state that it is a step in the right direction.

Recovery Rate is Better

The efficiency of water flooding operations during the past ten years has steadily improved. The absolute limits of ultimate recovery have as yet not been established and the prospects for increasing recovery in the future seem to be very good.

Increased recovery may be expected from more efficient application of the present methods of intensive development, from chemical treatment of the waters used in flooding, and from oil mining.

The examination of hundreds of cores and in particular the analysis of cores taken in watered out and at present abandoned territory has conclusively shown that the present method of water flooding is at the best an inefficient and from the standpoint of conservation a wasteful method of oil recovery.

Owing to irregularities in the sand body and especially due to its thin-bedded and lenticular character and to the variable permeability of the individual beds the flood does not travel uniformly throughout the entire thickness of the sand.

Cores of the sand body from watered out territory have in every instance shown that parts of the sand had been watered out with reasonable effectiveness, in other parts the oil had merely been concentrated and in some parts the sand showed no evidence of ever having been effected by flooding action.

The lowest limit of oil saturation in an average lense of Bradford or Richburg sand after water flooding is 15 to 20 per cent and usually it has been found that only about one-half of the sand has been flooded out to this saturation.

THE delayed drilling of oil wells was originally applied in an area where there was extreme variations in the permeability of various lenses in the sand body. This method has been adequately described by the writer in a previous paper.*

The principle of this method is to force a uniform flooding action throughout the entire sand body by delaying the drilling of the oil well until the entire sand body is saturated with fluid.

When the water is first introduced into the sand it will move more rapidly through the beds possessing the highest permeability and as these are filled up

*Torrey, Paul D., "Modern Practice in Water-flooding of Oil Sands in the Bradford and Allegany Fields," Transactions of the A.I.M.E., Petroleum Development and Technology 1930, p. 272.

with fluid and the oil concentrated into the center of the five-spot square, by increasing the pressure flooding action is accelerated in the beds of lower permeability since the capacity of the high permeability beds to hold fluid has been reached.

In this manner the oil is concentrated into the center of the five-spot square in each continuous bed of the sand body before the oil well is drilled rather than being pushed toward the center at variable speeds as in ordinary flooding operations.

It is therefore possible to produce from practically every bed of the sand at one time, which is impossible in the majority of floods for if sufficient pressure were applied to force rapid flooding action through the tighter parts of the sand the more open parts would permit a rapid migration of water that very likely could not be profitably handled at the producing oil well.

The results from delayed drilling in both homogeneous sands and in sands possessing lenses of variable permeability have been highly satisfactory. Delayed drilling has found rather wide application in the Allegany field and on three properties where uniform sand conditions exist it is likely that oil recovery will be increased from 20 to 25 per cent. On the original delayed flood the recovery has already been increased over 150 per cent.

Putting Gas to Work

The increase in recovery that has been obtained in reasonably homogeneous sands by delayed drilling is due to both a much more uniform flooding action and to the effect of expanding gas when the oil well is drilled.

In ordinary flooding operations the gas left in the sand after a long period of natural production is rapidly exhausted without appreciably effecting the movement of oil through the pore-spaces.

In the delayed system of drilling the gas is made to work as a motivating agent. Delayed drilling has not only materially increased recovery but it also affords an excellent means for production control and thereby conforms to every requirement of pro-ration schedules.

The addition of chemical reagents to the water to increase the efficiency of flooding action has not been successful, owing chiefly to a lack of knowledge of conditions existing in the oil sand. It is believed that chemicals may still be advantageously applied and one very important experiment is at the present time in progress in the Bradford field.

The application of oil mining is outside of the scope of this paper. Mining methods will eventually be applied and in another paper the possibilities of this system for increasing oil recovery will be adequately described.

New Books Reviewed

A NEW revised table of the chemical elements has recently been issued by P. C. Kullman & Co. Inc., New York City. This table contains the available essential data in the newer elements Hafnium, Illinium, and Ekacaesium, the last discovered this year, with a molecular weight reported to be 222.0, placing it as No. 87 in the table, alongside the older known Radon, sometimes called Niton.

The table gives the names of the elements in ascending order of their atomic numbers, and in addition to the latter, contains, the chemical symbol, latest revision of atomic weights, melting point in degrees Centigrade, and the year in which the different elements were discovered. According to the table, only one element remains yet to be discovered, No. 85, occurring in the periodic series between Polonium, mol. wt. 210.0, and Radon (Niton), mol. wt. 222.0.

The table may be obtained in any quantity at nominal figures from the publisher at 110-116 Nassau St., New York City.

* * *

ATTENTION may again be called to the work by Edward Thomas, "The Law of Chemical Patents" issued first in 1927, which should be of primary interest to every refiner and oil man. The present situation with regard to patents on refining processes, especially cracking, is so complicated and confusing to the lay mind, that this book should be of some aid in the present situation and of more service in the handling of future applications.

The book handles the entire subject from the practical point of view. It presents what has been said in the courts on every phase of the subject in a manner calculated to render the matter more enlightening to the layman. Probably the best idea of its contents may be obtained by giving the subheads treated, each occupying an entire chapter.

Nature of a Patent; Disclosure in a Chemical Patent; the invention, its date and nature; nature of a patentable process; of anticipation by prior uses; by prior publication; Nature of a Valid process claim in the patent; of infringement of valid process claim; Permissible amendments; amending patent after it issues; double patenting and the joinder of inventions; of assignments, licenses and royalties; contests between rival claimants; of patent suits and patent evidence and some other more minor subheads.

Actions taken in courts are cited with complete references to the legal documents involved, with quotations of the statements pertinent to the subject under discussion. Each chapter is introduced with a brief outline of the subject, and the remainder is devoted to quotations which definitely answer questions on which information should be available to those holding patents or about to apply for them.

Obtainable from NATIONAL PETROLEUM NEWS.

* * *

"HOW Cracking Produces Gas from Heavy Oils," presented by Dr. Gustav Engloff at the recent meeting of the American Gas Association in Cleveland, has been printed as U. O. P. booklet No. 77, just off the press. Free copies of this booklet may be obtained by addressing Universal Oil Products Co. 310 S. Michigan Blvd., Chicago.

Meters for Measuring Every Kind of Liquid

THE Buffalo Meter Company are manufacturers of liquid meters exclusively. A complete line of liquid meters is manufactured for measuring every flow of liquid from the small meters having an inlet of ½" and minimum flow of two gallons per hour to the large, heavy duty meters, with an inlet of 6" in diameter, and a rate of flow of 1000 gallons per minute. Following is a list of some present applications of Niagara liquid meters.

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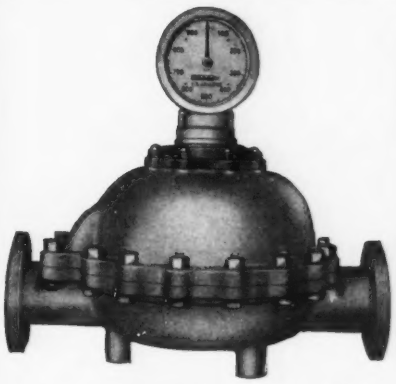
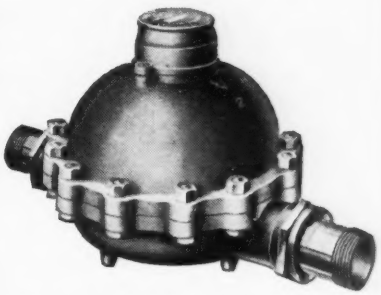
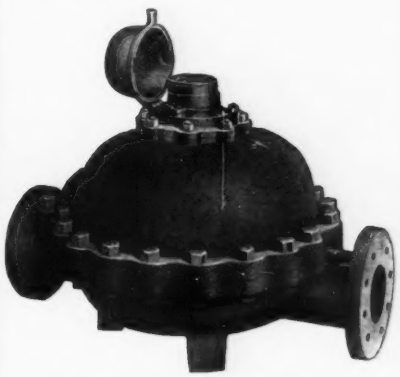


This is the 3" heavy duty type Buffalo-Made Meter. It may be used for any petroleum product including gasoline, kerosene, fuel oil or crude oil, and will register 200 gallons per minute. It has a vertical dial.

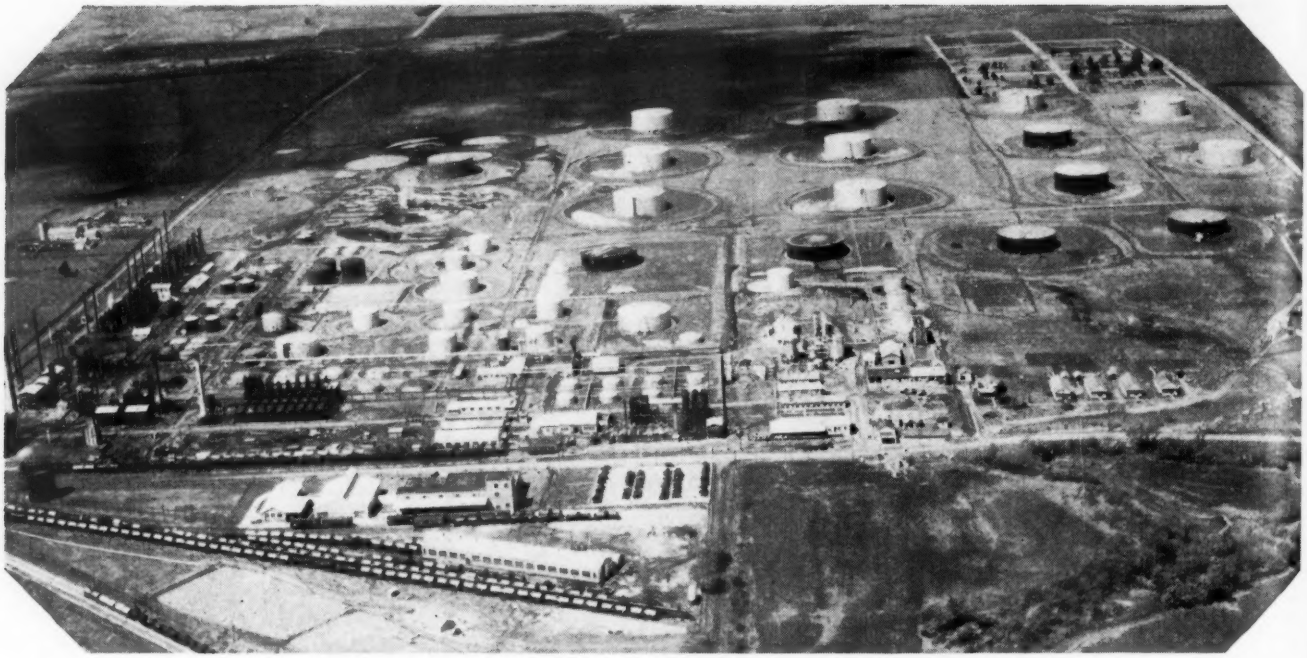


This is the standard 2½" hot water Buffalo-Made Meter. It will measure all the feed water needed for a 1200 h. p. boiler.



This is a standard 4" heavy duty cold water meter with a rated capacity of 500 gallons per minute. It will accurately measure the flow of water for as small as a 1¼" stream.

This is the famous 10" dial Buffalo gasoline Retailing Meter. The amazing increase in sales of this meter testify to its accuracy and serviceability.



Skelley refinery oblique or other good oil field oblique

Aerial Mapping Finds a Place In Oil Company Work

By Robert H. Hunter*

THE use of photographic maps to obtain information for the purchase of land or establishing the route of a transmission line, pipe line, or other enterprise, where a right-of-way must be purchased has become frequent.

All information on the character of the terrain, the type of cultivation, of development and cultural features, is quickly and secretly obtained. No curiosity is aroused among the property owners, and no advance information is possible as to the location of area under consideration.

The photographic survey covers a strip of country a mile or more in width and allows considerable alteration in the course of the line without running additional surveys. It is complete record of the property over which the line is to run, also of adjacent properties and their relation to the right-of-way.

Every ground detail appears and may be studied. Property lines may be plotted on the surface of the map. The photographic map records all obstacles and furnishes the information on surrounding territory by which they may be overcome.

It is possible by using these surveys to alter the line to avoid expensive property, and to make use of the least expensive sections available. Soil conditions and construction difficulties are often indicated by the vegetation and surrounding detail.

By the study of adjacent photographs in a stereoscope every detail may be examined in the office, including ground elevation, thus saving in many cases an inspection trip or relocation of the line due to local conditions which may be avoided.

Users have found large savings resulting from the proper use of these surveys. In some cases as much as 50 per cent of the property estimates have been saved.

When the construction has been completed the air maps become a record of all detail along the entire route, and furnish the exact location of every detail of the development.

In view of these facts some of the methods in use by prominent engineers connected with the construction of electric transmission lines may be of interest to the oil industry in as much as the problems of pipe line right of way are similar to those of the power line.

It has been the experience of the writer that in most cases the full value and utility of the aerial photographic strip map has not yet been realized by the engineers in pipe line construction.

A typical survey by these

*Aerial Surveys, Inc., Cleveland.

methods proceeds about as follows. Given the points to be served a general course is plotted on existing maps, if available the U.S.G.S. quadrangle sheets.

Care is taken to avoid natural barriers such as large bodies of water, towns or cities, impassable country, etc.

Having decided on a desirable course the aerial mosaics are made covering a strip roughly a mile and one half wide and as near as possible centered over the pre-determined course. The photographs are made at a scale of eight hundred, or one thousand, feet to the inch and enlarged to a corrected scale of six hundred feet to one inch. They are received on re-inforced panels approximately eight feet long covering about 10 miles of the line.

These panels are dowled or pinned in such a way as to register closely when matched together. In addition two sets of atlas sheets and two sets of ratio prints at the mosaics scale are usually made.

The atlas sheets may be made to show the mosaics as they are, or later, to show the additional detail of property lines and actual route of the line. Both the atlas sheets and ratio prints are made on matte surface paper on which pencil or crayon notes or lines show readily.

With a part of the strip available work begins in the choosing of a right of way. The maps are laid out one or more at a time and a line is stretched from the known starting point to the other end of the board or boards.

By careful study every obstacle may be studied on these maps and the line varied from point to point to avoid valuable property, settlements, buildings, streams and other barriers.

Every detail of the terrain under consideration is available and may be studied closely. It becomes possible to view several miles of proposed right of way as a unit rather than to scout it foot by foot on the ground. The record is exact as to ground conditions and does not rely on human memory or vision. In this way the entire line may be determined in the office and conditions studied by the engineer actually in charge of operations.

All of this, however, is only a part of the service performed by the aerial photographic map. Having determined the exact course of the right of way the property lines are sketched directly onto the map and each parcel numbered and indexed. This is done from local tax records and since existing lines of occupation are easily seen from the air, offers no great difficulty.

The mosaics now shows exactly where the line will be and through what property it runs.

In preparation for the actual purchase of the right of way each parcel through which the line runs is sketched on one of the ratio prints covering it and the course of the proposed line indicated. Measurements are noted and a proper description of the property prepared.

Where any deviation from the line is possible the limits of such variation are given to allow the field men to vary the line to best suit the property owners. The scale of the ratio prints is close enough to allow the buyer to re-write the property description by scaling distances on the photograph.

The line is now complete and preparations for purchase ready without having disturbed the owners or any information as to the location of necessary property having reached them. Except in a few places where study on the ground may have been necessary to determine construction difficulties no scout or survey party has set foot on the proposed right of way.

The work having been accomplished in the office has not been subject to delays because of weather or local conditions and has been under close expert supervision at all times. Properly organized the entire program can be accomplished in a surprisingly short time.

Several plans are used for the actual purchase of right of way. In some cases regular buyers cover the line progressing as they are able. The most economical purchase of right of way has been by the use of a large number of buyers working on a commission basis each of whom is equipped with the photographs covering a few parcels.

The buyer has in the photograph all the information to

How aerial maps are made, cut from booklet

Atlas sheet showing line and tower location in rough country. The towers are located on high points to carry the line from hill to hill

place before the property owner as to where the line will be and what parts of his property are affected, what fields and fences are touched and how close it will be to his buildings or improvements.

In this way over 250 parcels were purchased, comprising over 90 per cent of a proposed right of way for a transmission line, in a single day, by an engineering firm in the middle west. The saving in time as well as a material saving on the estimated property cost amounted to several times the cost of the entire photographic survey.

As these methods are tried and better understood by the engineers engaged in pipe line survey and construction they will undoubtedly be used as universally as they have been by the transmission line constructors.

How Aerial Maps Are Made

Photographs are made vertically through an opening in the floor of an airplane flying at an altitude from which ground objects appear at the desired scale. The photographs overlap 50 to 60 per cent in the line of flight. Each flight line of exposure overlaps the abutting side line from 25 to 50 per cent. Prints can be placed so that the images shown on the overlapping portions register exactly. Where ground information is available, exact measurements are plotted on a base. Photographs are located so as to furnish all detail to scale and location as it is set down by the engineer in a line map.

The prints are then glued to a suitable base. A photographic copy may then be made at the exact scale of the original mosaic or at any scale desired within reasonable limits.

Among the advantages of the air map, are the following:-

Time: it is possible to produce in a few days accurate information on areas requiring weeks and months for survey maps.

Clarity: presenting maps which may be read clearly by anyone.

Completeness: portraying the physical situation in all visible detail.

Cost: low cost 10 to 50 per cent of ground survey maps.

Wilson & Bennett Mfg. Co., Chicago, is building a three-story office addition to its main office and factory. The new building will include conference and display rooms, more space for art and mechanical research departments and larger offices for executives and sales members.

The Reclaiming of Rotary Drill Mud In the Ventura Avenue Field

By Jack N. Westsmith
N. P. N. STAFF WRITER

PROMPTED primarily by the necessity to overcome a serious waste mud disposal problem in the Ventura Avenue field, Associated Oil Co. recently put in operation a plant to reclaim this drilling fluid.

A second and important reason for such a unit was the expectation that it would improve the mud quality, make it uniform and reduce the costs.

Under the direction of H. W. Wickstrom, assistant chief engineer for the company, these accomplishments have been realized and, in addition, the new mud system has proved to be much more flexible. Mr. Wickstrom designed the particular process and has applied for patents to be assigned to the Associated Oil Co.

The plant is entirely new and unique in its basic principles and has aroused considerable interest among engineers.

For an individual well, the mud system in this field is no different from that in other fields. Mud is circulated from a storage tank, into the hole, out through a sand settling ditch and back to the tank. When it becomes contaminated with impurities, (sand, gas, oil, or water) it is discarded and fresh mud introduced into the system from a second tank of 500 barrels capacity kept full of fresh mud at all times.

Prior to the construction of the new plant all fresh mud was furnished by a central mixing plant. This unit simply mixed the mud mined from a nearby quarry by steam shovel, with water or thin mud, and pumped it to the wells as required, through a net work of pipe lines. Where the mud in circulation became fouled with impurities, it was discarded and flowed through flumes to one of several sumps or catch basins.

Topographically, the Associated Oil Co.'s leases at Ventura are so located that it is possible to gravitate waste mud from drilling operations into these basins situated in two canyons. The waste mud was allowed to accumulate behind earth fill dams thrown across these canyons.

Pumps mounted on scows skimmed the thin mud from the surface of the pools thus formed and pumped it back to the mixing plant to be combined with fresh mined clay. In this manner the quantity of clay to be mined was materially reduced.

H. W. Wickstrom, Assistant Chief Engineer, Associated Oil Co.

However, in the course of time the bulk of solids in the mud filled the catch basins and it was necessary to abandon them and construct new ones. Such a method of disposal was satisfactory as long as convenient and easily made basins were available. A little more than a year ago the problem of additional dam construction became acute when it was estimated the cost of a proposed dam would approximate $150,000 and would have capacity for accumulated spent mud for only two years.

As future structures would be proportionately higher in cost, the situation resolved itself into an economic and engineering problem that was solved by installing the reclamation plant.

Freshly mixed new mud is now no longer used at Ventura by the Associated Oil Co., as drilling wells receive their rotary fluid direct from this plant instead of from the central mixing unit. Waste mud from the wells serves as raw material for the new installation that was purposely built at about the lowest point on the lease.

This particular location was selected so that the spent mud could flow by gravity from the wells through existing flumes to the two principal catch basins and thence through newly constructed flumes to the reclamation plant. An additional reason for utilizing the existing sumps was that when mud is consumed by loss in circulation or used to put out fires, this accumulated mud furnishes a cheap and easily removable supply that would otherwise have to be obtained from the quarry.

With the co-operation of engineers of the Dorr Co., Mr. Wickstrom designed and built an experimental mud reclaiming plant to develop the process that was later installed on a large scale. Both units were constructed on the basis that the essential prerequisites of a complete and efficient rotary drill mud reclamation plant were the removal of the four impurities that contaminate the fluid during drilling operations, namely sand, gas, oil and water.

The tests indicated that waste

Fig. 1—General view of completed plant showing thickener tank in foreground, mud collecting flume at top and sand conveyor to right

mud, regardless of the proportionate amounts of these foreign materials present, could be reclaimed with the resulting product containing less sand than fresh mud, and yet retaining the same physical characteristics as the unused material.

Upon conclusion of the experimental tests the present unit with a capacity of 10,000 barrels per day was constructed and placed in operation in June, 1930.

Basic operation of the plant consists in first diluting the waste mud with several times its volume of water. This permits the sand to settle out and be removed mechanically in Dorr bowl classifiers.

Dilution in this manner accompanied by agitation also releases the entrained gas. The thin fluid, free from sand and gas, is then rethickened to a proper consistency in a Dorr thickener and the excess water added at the classifiers is recovered for re-use. Oil is also skimmed off at this step.

Fig. 1 shows a general view of the completed plant, and Fig. 2 the flow sheet and general arrangement of equipment.

Flow of waste mud from the catch basins gravitates to the plant through a flume and enters a 1000-barrel bolted steel surge tank, which has three superimposed outlets of different sized pipe required to keep the feed to the classifiers more or less uniform without valve control.

Outlets from the surge tank empty into a 5x3-foot mixing and distributing tank that is connected to the classifiers by four flumes for equal distribution of the mud. Some of the diluting water is added in the mixing tank, but the bulk is added directly to the classifiers.

Figure 3 shows the detail of construction of the classifiers, the mixing tank and launders, and the thickener in the background. The classifiers have two compartments, the bowls and reciprocating rake compartments. In the former, a shallow tank 15 feet in diameter, with a slightly concave bottom, the incoming mud feeds through an overhead flume into the machine where the heavier sand particles settle out over the bottom area. This material then is moved by a revolving rake-mechanism to a central discharge opening.

Beneath the bowl and extending out of the back side is the reciprocating rake compartment two feet three inches long, set at a slight slope. Sand from the bowl drops into this compartment and is conveyed by a series of rakes working intermittently at 15 strokes per minute to a discharge point.

Diluting water is added to the classifiers at about the middle of the reciprocating rake compartment and just below the water level. It flows through this mechanism and up into the bowl where it dilutes the incoming mud. This combined action of the water and rake effectively reclassifies the sand and frees it from all adhering mud. From the discharge point the sand is deliv-

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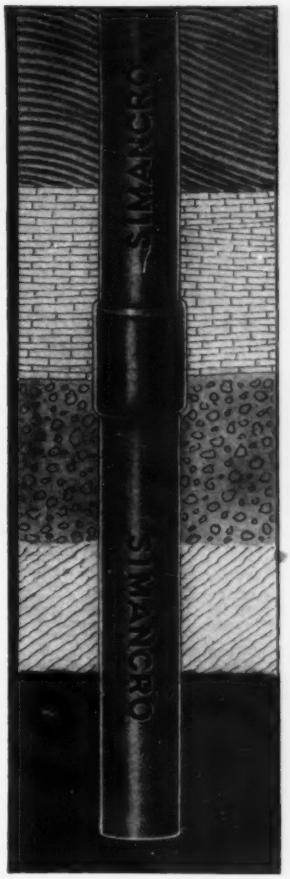

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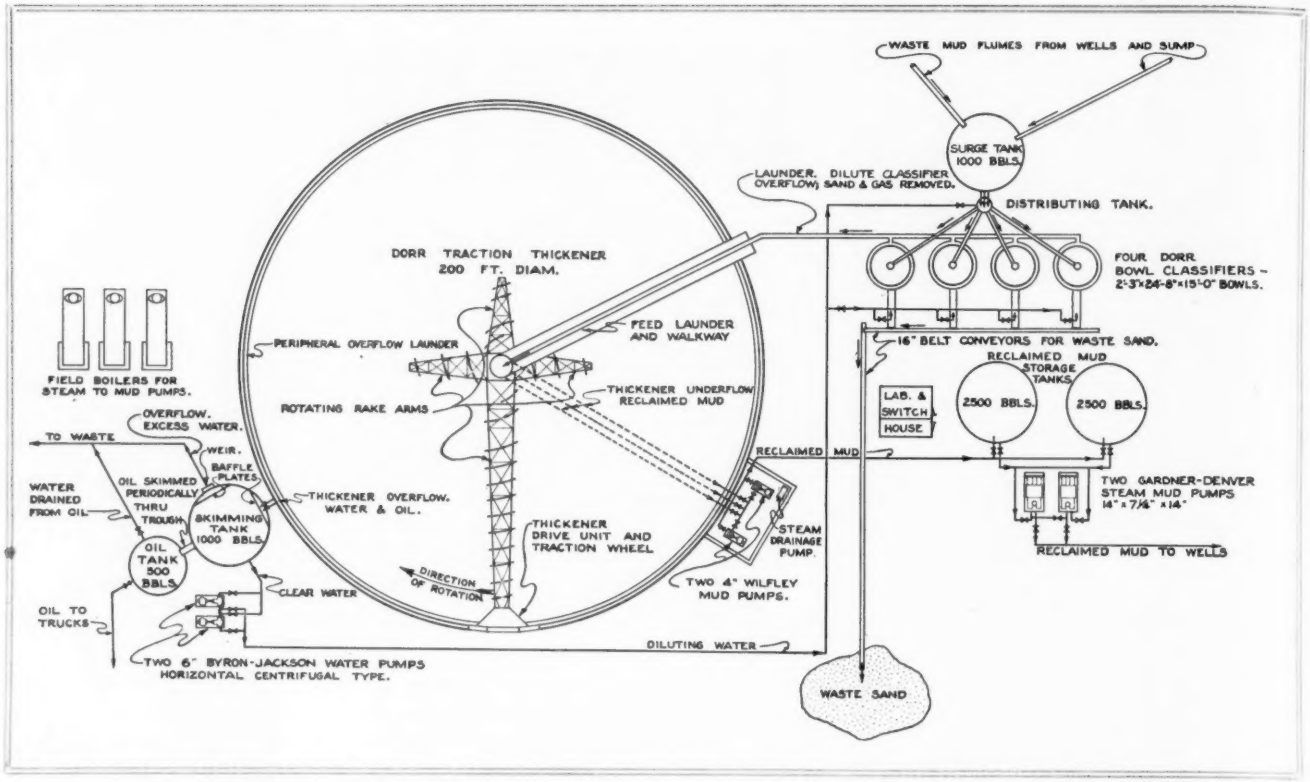
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WASTE SAND

Fig. 2—Flow sheet of rotary drill mud reclamation plant, Associated Oil Co., Ventura, Calif.

ered, with about 27 per cent moisture, to a system of 16-inch conveyor belts and carries to the dumping pile.

Overflow from the four bowls, dilute mud and water, flows to the center of a traction thickener installed in a concrete tank 200 feet in diameter.

This unit has a depth of about 8 feet at the sides and 18 feet in the center with an earthen floor sloping to the center. Its mechanism consists of a revolving truss supported in the middle by bearings on a concrete pier. The outer end of the truss rests on a rail fastened to the tank wall. A 5 h. p. motor rotates the machine around the tank at a speed of one revolution per 24 minutes.

The main truss and three auxiliary short cantilever beams set 90 degrees apart, are fitted with blades set at an angle to their path of travel so that, as the mechanism revolves, the settled mud is moved very slowly to a central point of discharge.

As the revolving blades move at a slow rate of speed below the normal surface of the liquid, the mud settles to the bottom, leaving one or two feet of practically clear water. This water and any oil floating on top overflows continuously into a launder placed around the inside of the tank, and from there it is discharged into separating tanks, where the oil is skimmed off and salvaged.

Water drawn from the bottom of this skimming tank is picked up by two 6-inch centrifugal pumps (one spare) and circulated back to the classifiers for re-use as diluting water. Waste mud from the wells is always more dilute than the finished product and there is, therefore, always an excess of water that overflows a weir into the skimming plant to waste. Use of weirs maintains constant water levels in the tanks.

Since the diluting water added to the classifiers is close circuited through the thickener and skimming tank back to the classifiers again, any desired amount of diluting water, within limits of the pump capacity, can be used.

From the central point of discharge in the thickener, the mud flows through suction lines running to two 4-inch Wilfley pumps (one spare) set in a pit adjacent to the thickener. At any one time there is approximately 20,000 barrels of mud in the settling tank. The upper portion has just entered and is, therefore, dilute, whereas the bottom layer has been thickening for two or three days and is of the required density.

This thick mud of maximum weight, normally about 80 pounds per cubic foot, is elevated by pumps to two 2500-barrel storage tanks which are always kept nearly full. In addition to this capacity of 5000 barrels the settling tank has nearly 20,000 barrels available for any emergency.

The mud is pumped from the shipping tanks to the wells intermittently as r e q u i r e d, through a system of pipe lines by two Gardner-Denver steam driven slush pumps hooked up in series-parallel. Pressure on these pumps varies from 300 to 700 pounds per square inch, depending upon the destination. Under normal operation the pump's steam valve remains open and all valves on the line are kept closed. In this way the pump operates only when a driller in need of mud opens his outlet valve.

The following tabulation

shows some typical operation results:

Test No.	—Feed to Plant— Bbls. per day	Lbs. per cu. ft.	0/0 200* mesh sand	Overflow from Classifiers Lbs. per day	Lbs. per cu. ft.	—Reclaimed mud— Bbls. per day	Lbs. per cu. ft.	0/0 200* mesh sand
1.....	14,050	72.5	2.9	31,800	66.8	9760	76.7	1.82
2.....	14,600	71.2	4.8	32,530	66.0	8320	76.8	2.35
3.....	16,350	72.5	5.9	36,900	66.8	9280	78.5	1.81
4.....	10,120	70.6	5.2	22,140	66.2	5170	78.4	1.56

*Note—All screen analyses in this paper were made by screening the sample through a 200-mesh sieve before drying and weighing the retained residue which is figured as a percentage of the sample's dry weight. Dilution of the sample, therefore, does not affect the results, whereas sand tests measured by volumes or based on wet weight give results which vary with the dilution of the sample and usually give lower percentages of sand than the more accurate tests based on dry weights.

It should be pointed out that the material passing 200 mesh is practically all fine sand and not clay. The classifiers remove sand considerably finer than 200 mesh. The following figures show results of typical tests of sand products from the classifiers, and typical screen analyses of the finished reclaimed mud.

Sand

% retained on 60 mesh	% passing 60 mesh retained on 100 mesh	% passing 100 mesh retained on 200 mesh	% passing 200 mesh
10.33	33.21	38.74	17.72
10.96	39.90	31.87	11.25

Mud

Wt. in Lbs. per cu. ft.	% retained on 100 mesh	% retained on 200 mesh (total)	% retained on 325 mesh (total)
80.0	0.13	2.4	4.3
78.5	0.0	0.94	3.44
82.5	0.46	2.30	6.40

Operations have proven that sand content of the feed makes no material difference in the sand content of the finished mud, as the classifiers are able to remove all of the coarse matter with no difficulty and at the same time remove a large part of the fine sand. Sand as it leaves the classifiers contains between 25 and 30 per cent of moisture by weight and yet is dry enough to be handled by conveyors and to be stacked.

The quantity of sand yielded varies from 20 to 70 tons daily, depending upon the rake action and the sand content of the feed material. Normally this proportion varies between 5 and 10 per cent although at times it has been nearly 35 per cent.

Based upon present mud requirements in the Ventura Avenue field the reclamation plant could handle waste mud from nearly 20 strings of tools. At present, however, the unit is operating ordinarily at not more than half capacity, due to curtailment of drilling operations.

Operation of the plant is very simple, requiring only one attendant at the plant proper and one at the boiler plant that produces steam for the shipping pumps. With the exception of shipping the finished mud, the system is continuous and automatic.

The principal control is on the amount of water added to the classifiers, because insufficient water does not allow the sand to settle out. Once this control is determined, it is rarely changed, as tests have proven that increase in water up to 50 per cent beyond the minimum specific gravity—an established figure—does not affect the results.

Power requirements of the installation are comparatively small. The four classifiers, the two belt conveyors and the thickener are each powered by 5 h. p. motors. The mud pumps and return water centrifugal pumps each have 25 h. p. motors.

Practically no maintenance expense has been encountered in operating the plant thus far and it is not expected this will prove an important factor since the equipment, except for the pumps, operates at slow speeds and has few wearing parts and no submerged bearings.

Finally the finished reclaimed mud is satisfactory in quality. It contains generally less than 2 per cent sand, as against

Fig. 3—Construction view showing classifiers in foreground in front of thickener and associated mechanism

about 6 per cent under the old system. It contains only traces of gas and oil, which, it is believed, have been actually absorbed by the clay particles during the years this mud was stored in the catch basins. Viscosity of the reclaimed drilling fluid is slightly greater than that of fresh mud, but it has been found that in practically all muds this characteristic increases with age under any conditions. The salvaged mud is black in color as a result of organic decomposition but readily bleaches out upon exposure to sunlight and air.

Additional research work on rotary muds is now being carried on by the Associated Oil Co. in collaboration with engineers of the Dorr Co., at a completely equipped and staffed laboratory at Ventura.

In conclusion it might be well to outline the advantages in mud handling that have resulted from the installation of this mud reclamation system.

1. A problem of waste mud disposal was eliminated and the mud content of existing sumps is decreasing slowly instead of increasing as heretofore.

2. Cost of supplying mud to drilling wells was reduced, due largely to elimination of this deposal problem, and the clay mining operation. Based on present figures, it is estimated the plant will pay out in about one year despite the fact that previous mud costs per barrel of oil were probably as low or lower than any in the state.

3. Quality of the mud has been improved and rendered more uniform, and the control has been centralized at one plant.

4. Not only sand, but all impurities in drill mud are removed simultaneously.

5. A supply of good clean mud is insured at all times since the wells can discard their spent fluid at more frequent intervals. No additional expense, other than the cost of pumping is required to reclaim twice as much mud as usual.

6. The reclaiming plant permits the characteristics and properties of the drilling fluid to be varied for penetrating different formations. Any desired weight, up to about 83 pounds per cubic a foot, can be obtained without the admixture of weighing agents,—not generally used at Ventura. Furthermore it permits chemical treatment of an individual well's mud supply in order to impart some desired chemical property. This is considered particularly advantageous, as it is felt there is no such a thing as "good rotary drill mud" in that a mud ideal for consolidating loose sands may be entirely unsuited for some other function.

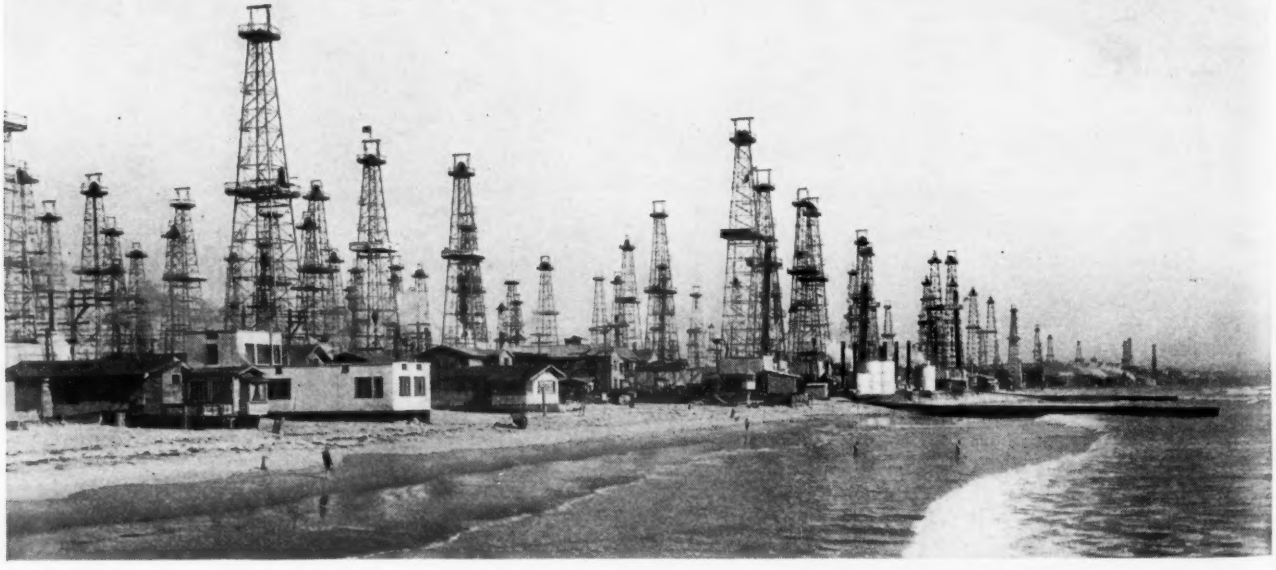
7. Ample mud is available in storage to meet emergency requirement. With distributing lines such a supply would be invaluable in case of fire.

8. It is believed, but not yet definitely proved, that bariod, hematite, and other weighing agents can be recovered from the reclaiming operations by a simple gravity concentration process.

Borne Scrymser Co., 17 Battery Place, New York, has developed two new devices for the lubrication of industrial machinery and equipment. They are the Bornes universal lubricator and Bornes universal compressor, which are meant to convert machinery with numerous bearings requiring constant attention to a modern central fill system.

The important advantages of the lubricator, as claimed by the company, are that it lowers maintenance costs, is an economizer of lubricant, eliminates the human element, reduces labor cost, applies clean lubricant under pressure and controls and lessens fire hazard.

Features of the compressor are an indicating rod showing the quantity of lubricant in the reservoir; a filling reservoir; check valve, hydraulic gauge, bleed valves and replaceable booster sleeve. The compressor can be either hand or power operated.



Here's what happens when an active oil field elbows in a quiet seashore resort. Formerly there was only a row of small cottages along the shore at Venice, Cal. Then an oil field was opened up and new derricks and storage tanks occupy the places where bathers sunned in the sand

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Conveyor Handling of Oil Drums Reduces Bulk Plant Costs

By E. L. Barringer
N. P. N. STAFF WRITER

DETROIT

OPERATING costs were reduced by the White Star Refining Co., at its compounding plant in the new Avery Avenue bulk plant Detroit, through automatic handling of barrels.

White Star had a bulk plant for many years at this location, but last spring the rebuilt warehouse for the compounding plant was opened. The tank yards for storage of lubricant stocks and for gasoline and fuel oil were unchanged, and the new warehouse was built without hindering operations of the plant. The new building was erected around the old, section by section, as it was torn out.

In addition to being a redistribution point for gasoline and fuel oils, the Avery Avenue plant is used for compounding all the company's brands of oils, motor and industrial. The finished oils are distributed from the plant by tank truck or in barrels. Practically all White Star service stations in greater Detroit receive motor oil by tank truck and a fleet is kept on this service.

Handling Finished Oils

Storage for finished lubricating oils is on the first floor of the new warehouse. It is moved to either truck or barrel outlet by gravity through 2-inch lines.

The truck loading rack is at one end of the warehouse, on a side street that separates the lubricating oil department from the gasoline and fuel oil storage. Loading lines extend through the end wall at the height of the tank truck openings. There is a gate valve at the end of the line and a quick action shut off valve on the end of the hose line that enters the truck.

The barrel filling rack is on the first floor, in the center of the warehouse. Movement of barrels through the plant is routed so that, after filling and weighing, they are in line for loading to trucks, or to freight cars. The warehouse is 114 feet wide, and the first floor is level with a freight car and stake truck. Avery Avenue passes in front of the plant, and a railroad siding at the rear.

The truck loading dock is on the street side, and just inside the doors at the head end of the building is a vertical elevator for moving empty drums to the second floor storage, or full drums to storage in the basement.

A section of a gravity roller conveyor feeds the barrels to the elevator. The only man power required is to roll barrels off a truck and onto the conveyor. Barrels are picked off the conveyor automatically as an empty space on the elevator comes around. To prevent crushing of barrels an automatic shut off was installed to stop the elevator when one does not go in properly.

Barrel cleaning is done on the second floor in the corner near the elevator. The remainder of the second floor at this

The elevator for moving barrels between the basement and first and second floors of the Avery Avenue plant of the White Star Refining Co. in Detroit. One barrel is seen going up the elevator, while another is on the trip end of the gravity conveyor ready to enter the next empty space on the elevator

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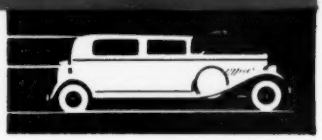

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end is for barrel storage. Various sections of the gravity conveyors enable employes to move barrels to any storage section, and to take them from storage to the spiral elevator on the way to the fill rack. All barrels are moved on end on the conveyors and elevators.

The spiral elevator moves barrels from the second floor, and places them on the conveyor fronting the fill rack on the first floor. When filling barrels employes stand on a wooden platform in front of the conveyor. After being filled, a barrel rolls by gravity to the scales. A section of the conveyor has been anchored to the scales platform. After being weighed barrels move on the floor, and are hand trucked to freight cars or to trucks.

Four workmen are employed on the 46 loading lines. These lines have gate valves ahead of the elbows, and quick action valves at the fill nozzles. A section of hose, about three feet long, between the end of the line and the nozzle, makes the line flexible. The nozzles are held up by counterbalancing weights.

With a force of 10 employes in the compounding department, about 400 barrels can be filled in a nine hour work day.

The spiral elevator that brings empty barrels from the second floor of the White Star Refining Co's. plant to the gravity conveyor in front of the fill rack

Handling Raw Material Lubricants

Lubricant stocks are stored outdoors in 17 tanks, at the head end of the warehouse, on the opposite end from the side street. Ten tanks hold 20,000 gallons each, and seven tanks hold 10,000 gallons each.

In the basement, near the wall by the railroad siding, is the pump house. Each of four rotary pumps has an outlet to the siding. Pumps and lines are connected so oils may be pumped into or out of any tank. To prevent error only two employes are permitted to operate the pumps and valves.

From the outdoor storage, stocks are pumped to the compounding kettles on the second floor. There are 25 compounding tanks equipped with steam coils, and air lines for agitation. There are nine 1000, eight 3000, three 2000, two 1500 and two 500-gallon tanks.

Finished lubricants are stored in 11 tanks on the first floor. There are four 10,000, four 7000, and three 3000-gallon tanks. From these tanks the oils move by gravity to the truck or barrel loading racks.

Layout of Warehouse

In addition to the compounding plant the warehouse has a boiler room, office, laboratory, truck dispatch, and employes' wash rooms.

On the second floor, along the street side, are the offices and laboratory. In a rear corner, along the side street, is the truck dispatching room, overlooking the lubricating oil and gasoline and fuel oil racks. Adjoining is the employes wash and locker room. Between the truck dispatching room and the laboratory are the compounding tanks. The remainder of the second floor is for barrel storage.

On the first floor, directly under the barrel storage, is the barrel fill line and more storage space. In the opposite end are the finished oil storage tanks, and in the rear corner the boiler room.

Two water tube boilers of 300 horsepower each comprise the steam plant. Steam is used in compounding, for heating the buildings, and for coils on fuel oil tank cars in winter. One boiler is operated in the summer, and both in winter.

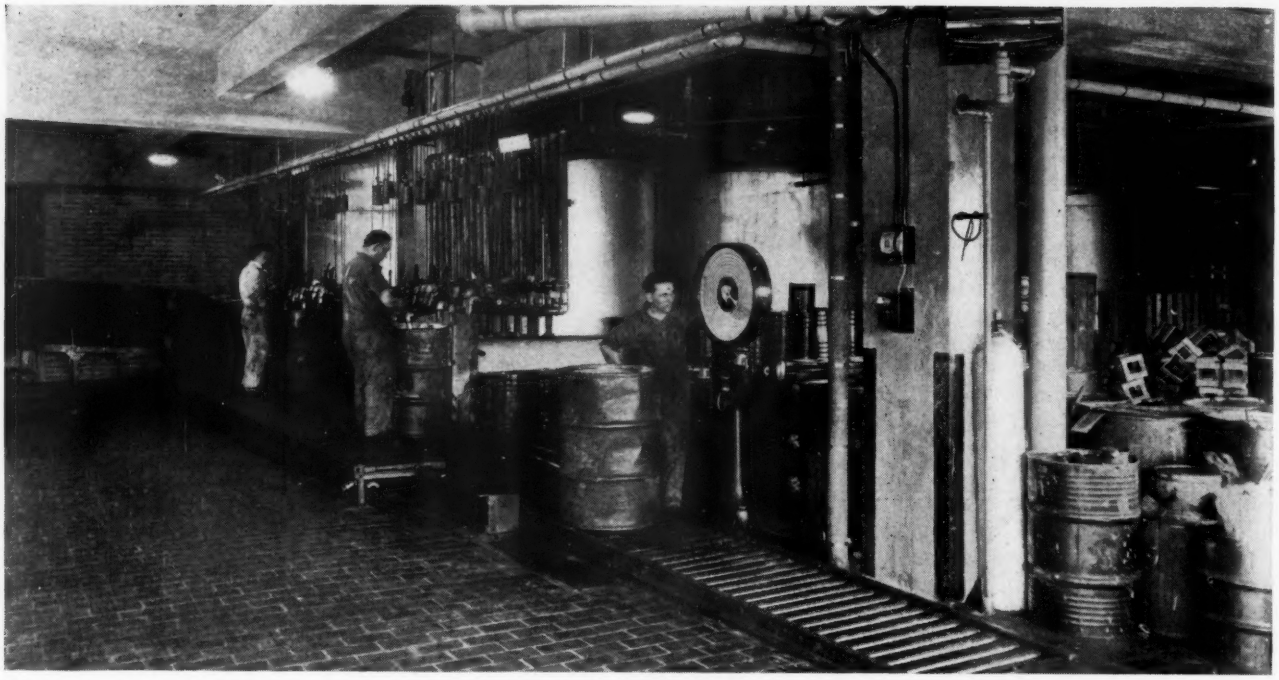
A trench back of the warehouse carries the steam lines for the fuel oil tank car sidings and for the smaller warehouse and truck garage. As a precaution against leaky coils in fuel oil tank cars the return line has a trap in a sub-basement side of the boiler room for removing any escaped oil.

The warehouse basement is under the center section only. It houses the lubricating oil pumps and has space for storing barrels. Filled barrels with oils that require an even temperature are kept in the basement.

Total barrel storage capacity of the building is about 4700 barrels. There is space for about 1200 in the basement, 1000 on the first floor, and about 2500 on the second floor.

Gasoline, Fuel Oil Storage

Across the side street is the tank yard for gasoline and fuel oil storage. There are twenty-



Filling barrels at the Avery Avenue plant in Detroit of the White Star Refining Co. Barrels in the background have just come off the spiral elevator. The forward drum is being weighed to determine contents. Then it will roll onto the floor to be moved to the freight or truck loading dock

six 15,000-gallon tanks for gasoline, one 15,000-gallon tank for kerosine, three 15,000 for naphthas, eight 10,000 and three 20,000 for fuel oil, and two 13,000-gallon tanks for light distillates.

The main truck loading dock has six racks. These are of steel, with a small sloping roof. A small platform is level with the top of the truck, reached by a ladder built in an end upright I beam. Like other loading lines, there are gate valves at the end of the pipe and quick action valves on the nozzles.

All lamps on the truck loading racks are enclosed in vapor proof globes.

Stocks, Storage, Garage

On the other side of the warehouse, opposite the light oil storage yards, are the lubricating stock storage tanks, a smaller warehouse and a garage in the order named.

The smaller warehouse is used for storing service station equipment, tools, and miscellaneous items about the plant. The garage is for storage of trucks operating out of the Avery avenue plant. Truck repairing formerly was done at this plant, but has been moved to the new garage repair shop at the east end bulk station.

Firestone Buys Station Dedicated to Women

WASHINGTON, Nov. 6.—Automobile Public Service Corp. which last Feb. 18 opened here the first station dedicated to the service of women motorists, has sold this station to the Firestone Tire & Rubber Co. Firestone one-stop service will be installed. Edison H. Baker and Robert L. Royall, who founded the corporation and built the station, will continue with the Firestone company, it was announced.

This station was one of the foremost in the national capitol. Description and details of its construction were published in NATIONAL PETROLEUM NEWS for April 9, 1930.

It occupies a high-priced lot at 13th and K streets, N.W. Products of 12 different oil companies are merchandised there. It carries 16 brands of gasoline dispensed through 19 metered pumps. It also carries the motor oils of several companies whose gasoline it does not handle.

The station was strictly a mercantile enterprise. The operating corporation maintained no bulk depot. Although it bought some of its gasoline in tank car lots, it received only tank truck deliveries.

"This station has been a success from the start," said Mr. Baker. "Within 10 days of its opening it began paying its operating overhead although built upon one of the most expensive sites in downtown Washington. The volume of business done in its eight months of operation is approaching the rate of 1,000,000 gallons annually and is rapidly growing."

Gewert Sales Co., Cuyahoga Falls, Ohio, has been organized by E. F. Corbett and J. C. Thomas to sell equipment for the service station. The organization will sell the output of the Gewert Manufacturing Co. of Reading, Ohio. This company's output has been taken for the past five years by the Firestone Tire & Rubber Co.

The company's line will consist of tire repair equipment including a new thermostatically controlled tube vulcanizer using dry heat, battery testers, air compressors, etc.

Mr. Thomas has been a purchaser of equipment for Firestone for the past seven years and Mr. Corbett has served the Goodyear and Firestone companies in service station departments.

ADVERTISING PAGES REMOVED

Widening the Selling Opportunities For the Man at the Pump

By R. H. Thomas

(Written Exclusively for NATIONAL PETROLEUM NEWS)

HAVE you developed the full capacity of your service station salesman to increase sales? Mere order taking, putting in the amount of gasoline and oil requested by the customer, brings in a certain amount of business, but underneath this surface may be many items in your station stock that could produce additional profits with some sales effort behind them.

Furniture polish, for instance, is a petroleum product, but are your customers aware that you carry it? Many gasoline customers may be going to the furniture store for polish when it would be more convenient for them to buy it at your station.

How to push these other items is told in this article by R. H. Thomas, in his conversational style that shows how the sales opportunity of the man at the pump may be widened.

YOUR sales record at this station doesn't look good to me," said John Smith, an oil company salesman, to his two operators on duty at a fine service station in a county seat town in Kansas.

"You are courteous and obliging to motorists who drive in here for a specific product. You keep the place immaculately clean; but, both of you are overlooking the importance of creattive salesmanship covering the full line."

"Just what do you mean?" asked Bill Thorpe, the man in charge.

"I mean that every man in sales work should strive to be something more than an automatic machine. In other words, dishing out exactly what is asked for without making an intelligent effort to persuade customers to buy other needed merchandise from you, is not a display of salesmanship.

"This can be done without in any way boring or creating the ill-will and displeasure of those who come here. You may be surprised to know that due to our neglect many of our customers are driving elsewhere, where more aggressive methods of merchandising are in vogue, to buy petroleum products which we have for sale right here." Bob Ford, the second man on the job, had been listening attentively and broke in.

"Neither of us mean to be neglectful of our duties, I can assure you, Mr. Smith. Will you be so kind as to tell us—and show us—just how we can be more aggressive in sales work without jeopardizing the trade we now enjoy? We certainly want to increase the output here if there is any possible way of doing it."

"Well," said Smith, "a farmer—George Thurlow and his wife—drove out of this station an hour or so ago, after you had filled his tank with gasoline, wiped his windshield, filled his radiator, etc., and he immediately drove to Main street and parked in front of Hyman's furniture store.

"Mrs. Thurlow went into the store—and I followed her at a distance. The first thing she asked for was a quart of good furniture polish and then some floor wax. I never said a word but it caused me to do some thinking because I knew you had both these products for sale right here at the station. The prices she paid were exactly 20 per cent higher than they were here—and the products she purchased were not as good as yours.

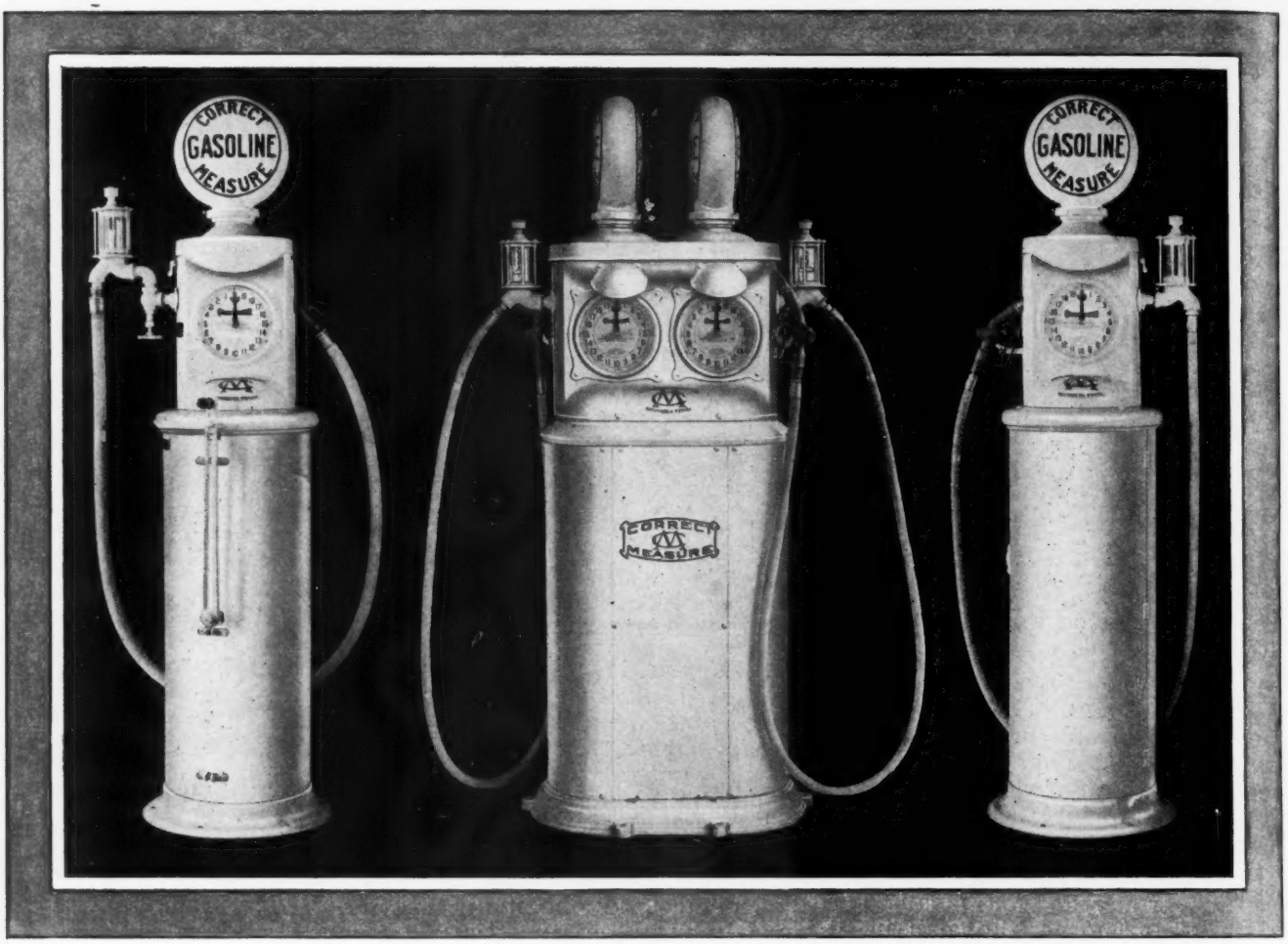
"So far, I have never seen either of you hand out a single piece of advertising literature to a customer since you have been on the job.

"This literature has been prepared with a great deal of care and for a specific purpose—and after the expenditure of much money. I have never seen you hand out a can of polish, household lubricant or anything else for customers to look at while you were wiping off the windshield or filling the tank of replenishing the oil in the crankcase.

"Practically every customer that drives in here has a washing machine or some other piece of machinery which requires grease, aside from the car driven. What effort do you make to sell it? Every home has need for a household lubricant in connection with sewing machines, vacuum cleaners, tricycles, guns, pistols, etc., etc.

"Why not let people know that it is for sale here? A small percentage of your customers have their cars greased by you at the station—while dozens of others do their own greasing. Who supplies the grease?

"Why don't we go after this business—thousands of dollars worth of it? Dozens of others buy their motor oil in 15-gallon drums and save quite a sum by



CORRECT MEASURE

Meter Pumps
Visible Pumps
Gallon Pumps
Airport Pumps
Gear Flushers
Drum Cleaners

In planning new service stations or in devising ways and means to improve the old, you will find it advantageous to consider the qualifications of the improved Correct-O-Meter.

Equipped with the "Micro-Meter" for positive displacement measuring, the Correct-O-Meter provides even greater accuracy than ever before regardless of variation in gasoline gravity or delivery speeds.

In addition to its unfailing accuracy, the Correct-O-Meter's outward appearance adds a distinctive touch to any station—an important factor in today's methods of marketing gasoline.

With an appearance that invites patronage plus an all-round efficiency that maintains it—the Correct-O-Meter can assist you in building repeat sales as it has thousands of gasoline marketers the country over.

Detailed information on Correct Measure equipment will be mailed to marketers on request. Write for it today.

CORRECT MEASURE COMPANY
ROCHESTER·PA

doing so. Who gets this business? You have not sold a single 15-gallon drum of oil during the past four months.

"Now, do you boys see what I am driving at?" asked Smith.

"We certainly do," answered both men at once.

"Good," replied Smith. "Now what are you going to do about it? That's what I am most interested in."

"Just give us a day or two to get organized," answered Thorpe, "and we'll show you that we appreciate having the matter brought to our attention in such a striking manner."

"All right," said Smith, "if you are in earnest about this, what do you say if we hold a little 'get-together' tonight and we'll decide on a program of procedure and I'll stay right on the job here with you for a couple of days to help you get going on it?"

"That will be great," said Thorpe as he smiled feelingly at Bob.

"O K," answered Smith. "See you at 9 o'clock right here."

With that he walked off and the two men resolved with each other that they would enter into the spirit as well as the letter of any selling campaign that Smith might inaugurate—and in such manner as to bring about fruitful results if that was possible.

The meeting was held that night, and a definite plan outlined for going after the business. Everybody was sold on it, and it was to be put into effect the next day.

After Smith had put on his coveralls the next morning he slipped down to the service station just as Thorpe was opening up at 6 o'clock. Within five minutes Bob had arrived—although it was not his morning to be on the job until nine.

The first thing Smith and the men did was to set up a fine display of 15-gallon drums of motor oil in pyramid form at the inside edge, just off the driveway, where it would be conspicuous to motorists. A big placard topped the pyramid reading as follows:

" 'BETTER LUBRICATION CANNOT BE PURCHASED AT ANY PRICE.' SAVE $4.50—30%—TODAY!"

Next, an excellent window display of specialties, household lubricant, polish, floor wax, cream separator oil, belt dressing, harness oil, fly spray, etc. were placed in the wide front window.

Red, white and blue crepe paper streamers about an inch wide formed a fan-shaped back ground for the display—something neat and artistic in appearance.

A convenient little cabinet, containing an assortment of advertising literature, was tucked away just underneath the window display.

Each pigeon-hole in the cabinet had at the top a sticker

R. H. Thomas

reading gasoline, motor oil, grease, household lubricant, fly sprays, polish, floor wax, cream separator oil, belt dressing, harness oil, etc., in order that there would be no difficulty or time wasted in reaching for exactly what was wanted without a moment's hesitation.

"On the square, this looks a little more business-like, doesn't it?" remarked Thorpe, as he glanced at Ford—his eyes sparkling with enthusiasm.

"It sure does, boy," answered Bob, "and that's not all—these displays are attractive and will enable us to hold the motorist's attention while we are talking our goods."

Just then a farmer drove in in an old model T Ford.

"What's going on here — a sale?" asked the farmer as he stopped his car in front of the pump and glanced in the direction of the 15-gallon drums.

"Exactly," replied Smith, with enthusiastic expression, as he walked briskly to the car. "Let me see, I ought to know your name as well as my own; but, I just can't call it this minute if I was to hang for it?"

"Johnson is my name," informed the customer.

"Why, sure—that's right—Smith is mine. Well, I'll tell you, Mr. Johnson," he continued tactfully, "about 25 cents per quart is the lowest price paid for good oil at garages and service stations.

"A saving of 7½ cents per quart can be effected by getting a 15-gallon drum here, with a reversible faucet, and taking it home. This gives you a convenient supply of 60 quarts at your disposal.

"By replenishing the oil in your own crankcase you always know where the oil level is—you watch it—and you are careful to see that you close the pet-cocks so the oil in the crankcase will not drain out and cause a burned out bearing.

"The owner of a car is sure to be more careful than anyone else about matters of this kind. That's natural, too. It's his car—his own money paid for it.

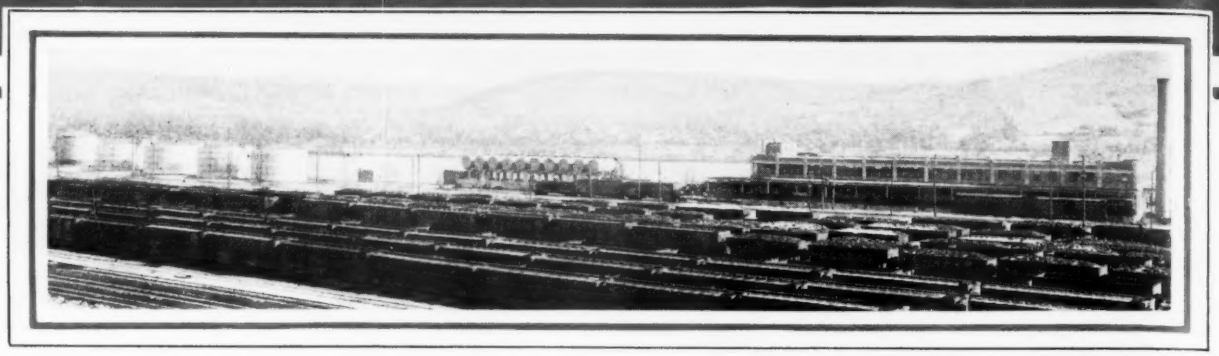
"We train our men to be very careful about these matters—and they are, too; but, I'm sorry to say that I have seen plenty of burned-out bearings as a result of someone forgetting to close the pet-cocks after checking the oil level on cars like yours.

"A savings of 7½ cents per quart is equivalent to 30 per cent—and represents the interest on more than $112 for a year at 4 per cent. Now, that's worth saving!

"Just step over here a moment, Mr. Johnson,—I want to show you something. See that sign,—'Better lubrication cannot be purchased at any price?' That's as true as anything can be; because, the oil was thoroughly tested out in the laboratory and on the road, under actual operating conditions in all parts of the country, before it was offered for sale to customers.

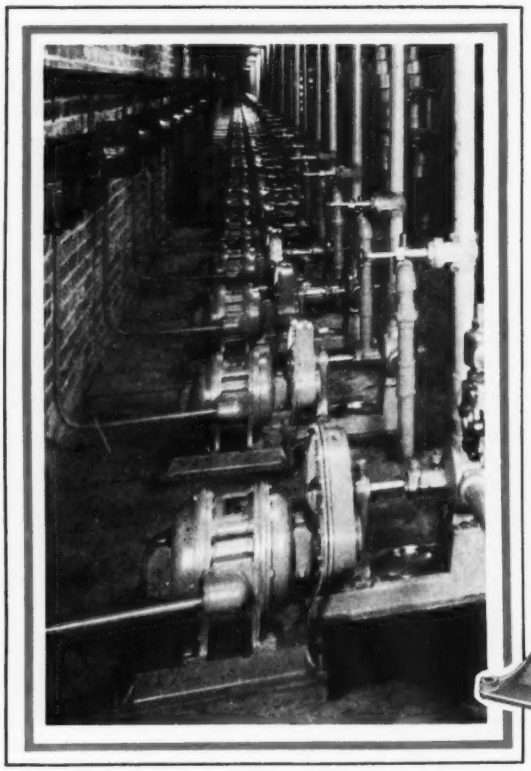
"This company could not afford to offer it for sale until they actually knew what it

In buying Rotary Pumps-

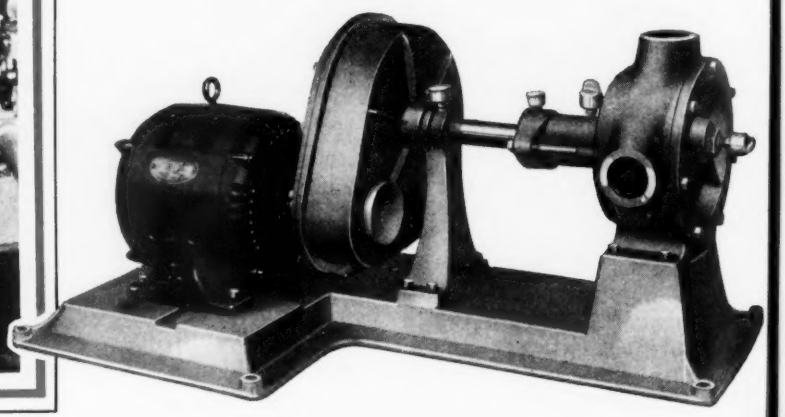


Above: The recently completed Cincinnati bulk plant of the Pure Oil Company. Viking Rotary Pumps were installed because of their nationwide reputation for efficiency, trouble-free service and low operating cost.

THIS installation of Viking Rotary Pumps is but typical of hundreds of installations in the bulk plants of the country's leading oil companies. You can't go wrong by following the judgment of the industry's leaders. For the most G. P. M.'S with the least power requirements and lowest operating costs . . . install Viking Rotary Pumps.



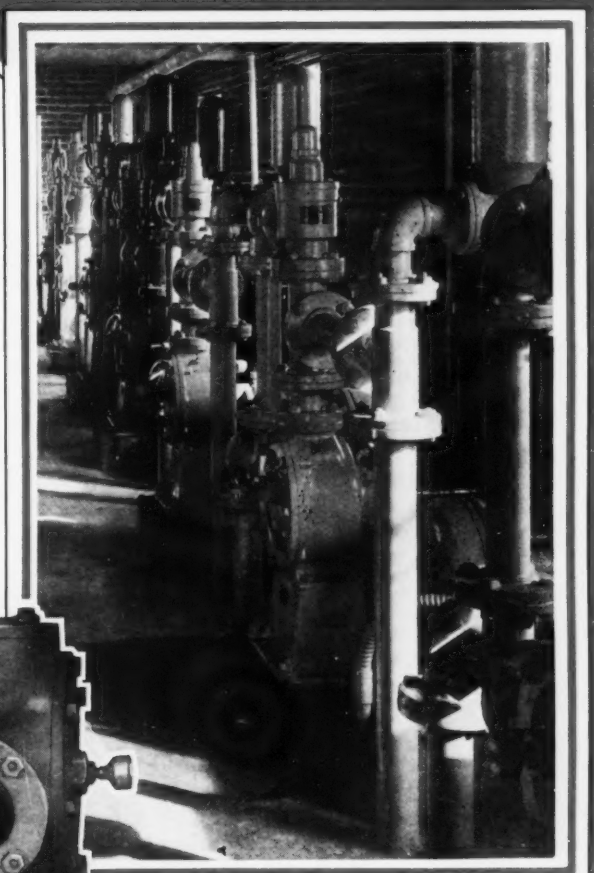
At left: A battery of thirty-nine, two inch Viking Rotary Pumps installed in the Cincinnati bulk plant of the Pure Oil Company. Each pump has a capacity of 50 gallons of "lube" oil per minute. Viking's simple design—just two moving parts—and Viking's sturdy construction are assurance of years of low-cost, trouble-free pumping service.

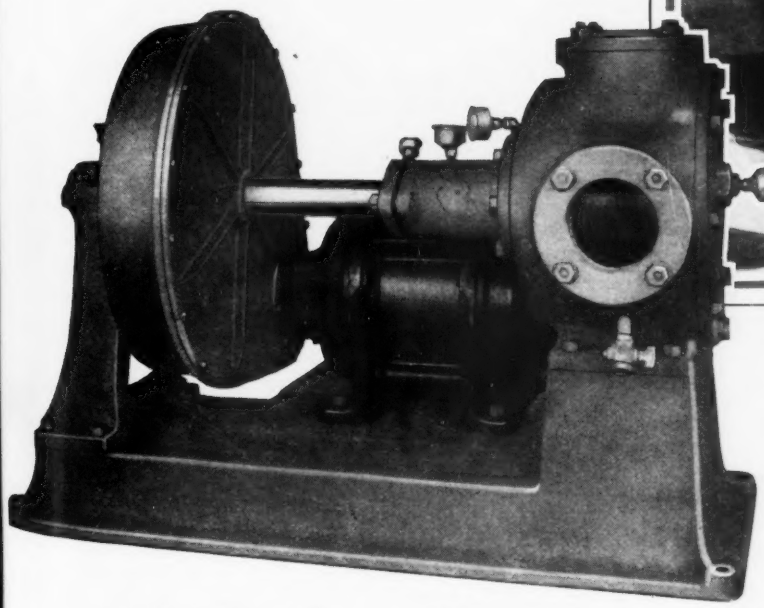


VIKING PUMPS

be GUIDED *by the* SOUND JUDGMENT *of the* LEADERS

The plant engineers of America's leading oil companies are hard-headed business men. Their only objectives are plant efficiency and low operating costs. Any item they purchase for plant installation must withstand their cold, analytical reasoning—their wide experience—their never ending search for the best. These expert engineers prefer and purchase Viking Rotary Pumps . . . because they deliver the most G.P.M.'S with the least power requirements at the lowest cost. Be guided by the judgment of the experts . . . install Viking Rotary Pumps in your plant. Write today for **FREE** Viking Catalog and Special Oil Bulletin.





Above: This row of seven Viking Rotary Pumps, installed in the new Cincinnati bulk plant of the Pure Oil Company will be on the job for a long, long time . . . with a minimum of service or repair expense. These seven pumps have a total capacity of 2700 gallons of gasoline per minute.

Viking Pump Company

of Delaware

Cedar Falls, Iowa

would do as compared with other motor oils on the market.

"What's the price of one of them drums?" Johnson asked.

"Why, only $10.50—reversible faucet 'en all. I presume that you believe in using the grade of oil recommended in our charts by engineering experts—as all thoughtful car owners do. The heavy grade is recommended during this exceptionally hot weather—and that's what you want, isn't it?"

"I do believe that would be the best for this time of the year," answered Johnson.

Smith needed no further invitation to pick up the 15-gallon drum and place it in Johnson's car. With the air of one who was not half through he remarked. "Now, you want your gasoline tank filled don't you?"

"Yeah, guess you better put in five," came the answer.

Smith jumped in the car, lifted the cushion, and stuck his measuring gauge in the tank. As he drew it out and glanced at the wetted surface he quickly showed it to Johnson and informed him that his tank was nearly empty. "It will take nine gallons, easily, and save you another trip to a service station for quite a while by filling it up right now while you are here. I better fill it, hadn't I?" he suggested.

"Cash is a little scarce right now, Mr. Smith. I didn't think I was so low on gas as that; but, I guess, perhaps, you had better fill 'er up. I guess I can dig up enough to pay for it."

"That's it," came Smith's retort. "Times are a little bit hard and for that reason it behooves everyone of us to make our money go as far as possible by buying larger quantities of what we actually need and getting the benefit of quantity purchases.

"It would pay any car owner to go to the bank, if necessary, to borrow $10.50 at 8 per cent, so he could come here and buy a 15-gallon drum of oil and make a 30 per cent saving. By doing that he would still be 22 per cent ahead of the game.

"The same thing holds true—only in a different way—in filling the car with gasoline. A man's time is worth money on the farm, and if one trip to the service station can be spared to be devoted to useful work, he is ahead just that much. A full tank lasts none too long when one does considerable driving, anyway."

Johnson made no comment but was visably impressed with the fact.

"Let me fill that radiator," was Smith's next comment as he hustled around to the front of the car, while the farmer's hand reached down into his pocket for the necessary change.

"Guess my personal finances are lower than I thought they were. Got a First National bank check?" asked the customer.

"You bet—step right into the station and I'll fix you out in just a second," answered Smith as he screwed the cap back on the radiator.

Just as Smith stepped into the station he looked at Johnson and pointing to the window display said, "Just look at the useful products we carry in stock here. Polish for cars and for furniture, sewing machine oil—just as suitable for a gun or an electric motor as for a "Singer" or a "Wheeler an' Wilson," floor wax, grease for cars and grease for wagons, harness oil, belt dressing, fly spray, and all such petroleum products as are useful on the farm.

"I want to have you take home a little pamphlet on each of those products so you and your wife may look them over tonight. In case you have need for anything we carry, you can save money by getting them right here. By the way, Mr. Johnson, what kind of a cream separator do you own?"

"Oh, mine is a DeLaval. I get my oil for it from that company, too—it's a special oil they get out just purpose for that machine."

"Why, Mr. Johnson," said Smith, looking him straight in the eye—"the DeLaval company certainly manufactures a wonderful cream separator but they do not run a refinery. They don't make a pint of oil.

"They just buy it as you do yourself—and then they resell it to you and the other folks who buy their machines—and at a profit, of course.

"I want you to take just one gallon of our cream separator oil home with you today—the price is much less here than you have been paying—and know that I am telling you the truth when I say that no oil will give better lubrication for your separator."

"Well, I am going to be in

Station Modeled After Tank Car

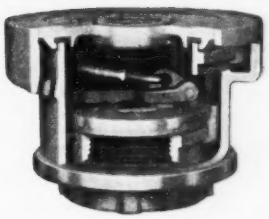
CRESTON, IA.—A service station modeled after a tank car has been opened on federal highway 32 here by the Banks & Summey Oil Co. It is as nearly an exact replica of a tank car as is possible to make a service station. even to the wheels painted at the sides and a dome and dome cover on the roof to which is attached a gasoline price sign.

The station canopy seems to have been cut right out of the car. Windows and doors carry out the station idea. The sales room is at the front and a lunch room at the back. Two gasoline pumps are placed between the canopy pillars.

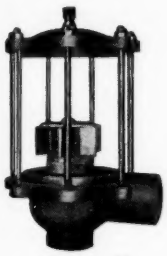
Tourist cabins also in the tank car pattern have been erected in connection with the station.

Increase Efficiency and Eliminate Loss with ‹OPW› Equipment

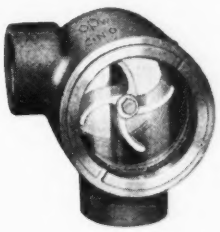
Cat. No. 74
Bronze Wet Hose Nozzle Valve



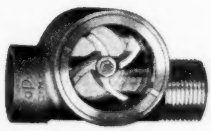
Cat. No. 36
Lock Type Flush Fill Box —Quick Opening



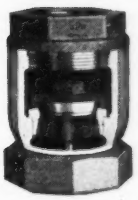
Cat. No. 55
Type-A Visi-Flo



Cat. No. 45
No. 2 Bronze Visi-Flo



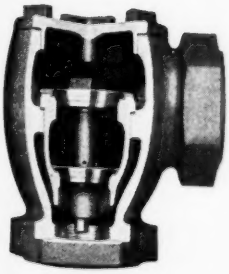
Cat. No. 44
Bronze Visi-Flo—Male and Female



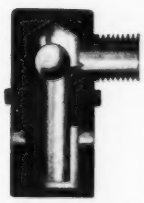
Cat. No. 69
Single Poppet Vertical Check Valve

Cat. No. 65
Double Swivel Ell

Cat. No. 66
Single Swivel Ell



Cat. No. 37
Double Poppet Angle Check Valve, Cage Type



Cat. No. 75
Bronze Angle Vacuum Breaker

Your profits depend largely on the efficiency of your equipment. You want the kind that will give service at high speed, simplicity in operation, absolute accessibility at all times, easy replacement in an emergency, and reduce breakages to a minimum.

O. P. W. products are winning the nation's praise because they meet the demands of the gasoline service station and bulk storage plant with an efficiency that is difficult to excel.

For instance, take the different types of Visi-Flo. Where state laws require a Visi-Flo on the meter pump, O. P. W. wins the preference.

Each Visi-Flo is made of high-grade material, combined with expert craftsmanship to give continuous satisfactory service. This is true of all O. P. W. equipment. Let us tell you about the complete line. *Mail the coupon.*

THE OHIO PATTERN WORKS & FOUNDRY CO.
2730 Spring Grove Ave., Cincinnati, Ohio

The Ohio Pattern Works & Foundry Co.
2730 Spring Grove Ave., Cincinnati. Ohio

Send me a copy of your catalog.

I am interested in.....

Name .....

Address.....

City..... State.....

need of some before long; but, I hesitate in making any change. The machine cost me $160 and I certainly don't want to put it on the bum by trying to save a few cents on oil."

"Of course, you don't want to put it on the bum — and that can't be done with our oil. There are more than 200,000 cream separators sold in the United States every year and we lubricate our share of them with this very product you now hold in your hand—and which you will want to try.

"We consider the cream separator the most essential machine on the farm. Used twice a day, the year around, it more than saves its original cost each year. Losses from the use of wornout cream separators—often caused by faulty lubrication—come mainly from four sources:

"1. fat left in skim-milk.

"2. loss of skim-milk and its food value when the separator delivers cream of low test.

"3. loss in express charges on excessive amount of skim-milk in marketing low test cream.

"4. loss in quality of cream.

"We know exactly what the cream separator requires in the way of a lubricant to get best results in skimming and to provide for ease of operation—and that is the product in your hands that will do the business. There are other cream separator oils that are just as good as this, too, but when you get such an oil you are compelled to pay more money for it.

"Our company makes this oil and sells it to you without having gone thru other hands—all of which would be justly entitled to a profit on their investment. So, I ask—why pay more for cream separator oil when you cannot buy anything better at any price?"

"Let's see now," casually remarked Smith as he hurriedly started adding—out loud:

"The 15-gallon drum was $10.50; 9 gallons of gasoline, $1.80; 1 gallon Separator oil, $1.20.

"The whole bill is only $13.50, Mr. Johnson, including the separator oil. Now, you can just give me your check for the full amount and I know as well as I know anything that you are going to be delighted with everything you bought here today."

"All right, I'll just try that cream separator oil, too, inasmuch as you say it's so good; but, may the Lord help you if it ain't good."

Smith thanked him for his business and asked him to drive in whenever he came to town, and as he slipped the advertising matter into Johnson's hand he said, "You and Mrs. Johnson read this over; and when you are in a rush for oil or gasoline or anything else that we deal in just give us a ring on the telephone—560—and I'll guarantee to have our tank-wagon man out there right off the bat. Mr. Hikup, our agent, is a prince of a man, and you'll like him. Goodbye, Mr. Johnson, come in again, won't you?"

GASOLINE and motor oil are not articles of every day commerce that your customers can handle, in which the sense of touch may be used in selling. But package goods, like furniture polish, insecticides, auto polishes, household lubricants, and other petroleum prouducts can be handled by the customer. Once the customer has the package in his hand for inspection while the gasoline tank is being filled more than likely he will keep it. Try it at your service station after you read Mr. Thomas' article.

Johnson drove out and then Smith looked at Thorpe with the remark, "Well, we got rid of a 15-gallon drum, a gallon of cream separator oil and four more gallons of gasoline than he asked for. Not such a bad start anyway.

"Now, I'm going to ask you fellows to try your hand at selling 15-gallon drums and cream separator oil—and at getting the motorists to fill their tanks instead of taking five. I'll try the next customer I wait on for something else we have to sell.

"Size up your customers," he cautioned. "A farmer must be approached in a manner quite different from the bank president. Not that the bank president is one whit better than the farmer, but the farmer is accustomed to taking care of machinery and has no worry about getting a little oil on his hands. His requirements are more varied and he is a better prospect for the full line.

"However, every customer should have his tank filled to capacity and his oil maintained at proper level in the crankcase.

"That's not all. Watch for oil which appears to be thinned out and which ought to be drained and replenished. A matter of this kind brought to the attention of the banker will be appreciated and it will enable you to increase your sales of motor oil and flushing oil. When the old oil is drained, the crankcase should be thoroughly flushed out with a cheap flushing oil—the kind you have for that purpose.

"Let's be careful not to bore or displease anyone; but, on the other hand, let's not forget that we are here to sell merchandise."

As he was saying this in drove a big Lincoln car with a fine looking middle-aged lady behind the wheel.

"I'll wait on her," remarked Smith, as he grabbed a pint of liquid polish and dashed up to the car as it stopped—doffed his cap—and inquiringly suggested, "You want your tank filled with (blank) don't you? It's the very best of premium gasoline."

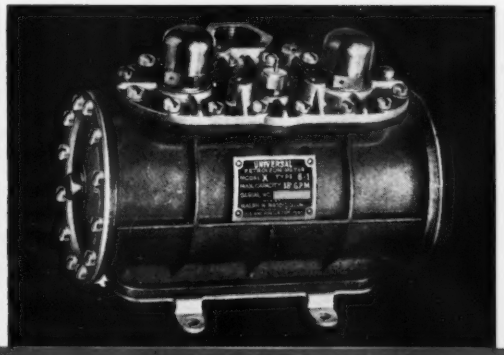
"Why . . . I think so," answered the lady.

"You will be glad to look this over while I fill your tank and check your oil," courteously remarked Smith, as he handed her the can of polish.

He then busied himself in filling the tank and in checking the oil and in filling the radiator. As he quickly moved about, his trained observing glance at the tires told him they were in need of more air.

The service at the island having been completed—and before saying anything about settlement—Smith asked the lady to pull over to the air-stand.

He said, "You need some air in the tires. It will take but just a moment to properly inflate the tires and that may be the means of saving you quite a little inconvenience on the road. You have an elegant car,



THE UNIVERSAL DISPLACEMENT METER FOR DISPENSING PUMPS

Occupies a dominant position in the Petroleum Industry

because . . .

It is consistently accurate . . . It is durable . . . It is speedy . . . It is dependable . . . It is simple in structure . . . It is easy to install.

Start today and make your pumps pay better with Universal Displacement Meters. Obtainable through reliable pump manufacturers. Detailed information sent on request. Write or wire for descriptive literature.

RALPH N. BRODIE COMPANY, INC.
61st and Lowell Streets Oakland, California, U. S. A.

UNIVERSAL METERS

MAKE GOOD PUMPS BETTER

but a big, heavy car like yours is hard on tires unless there is air enough in them."

The lady drove over to the air-stand and Smith speedily inflated the tires.

"I see that your car has just been washed and polished, otherwise I would be glad to wipe off the windshield for you," he said.

"That is very kind of you," answered the lady. "Now, how much do I owe you?"

"Twelve gallons of gasoline at 22½ cents is $2.70," answered Smith.

"Your oil was up to proper level and there is plenty of water in the radiator and of air in the tires—so you are O K on that score.

"If you have use for an excellent polish, that pint can you were looking at will cost you only an additional 35 cents or the total would be $3.05.

"However, I don't want you to take the polish unless you actually have use for it. I merely handed it to you so as to acquaint you with the fact that we carry a high grade line of polish, cleaners, household lubricants, etc. We believe it is our duty to let folks know about them so they will know where to get them when they have need for such products."

"This isn't a sticky polish, is it?" asked the lady.

"Not at all. It is quick drying polish which gives a high, glossy finish, with but very little rubbing," answered Smith.

"Then I will just try it. You said the full amount is $3.05," she said as she handed Smith the money.

He thanked her kindly and asked her to come again as she departed.

Just then the mail man walked into the station and left the morning paper. Smith picked it up, as there were no customers to be served, and scanned it quickly while standing. Suddenly he exclaimed, "What do you think of this, boys?" and then he read:

> "The state game warden reports an unusually large number of licenses issued to hunters from the various counties. It is expected the coming season will far exceed any previous one in the number of licenses issued.
>
> "Polk county heads the list with 3876 licenses already issued and the rabbit season has not yet opened. In a single day the auditor of Polk county issued 225 licenses. One of the surprises is the number of women who have taken out hunting permits."

"Yes, I guess there will be a great many folks out hunting this fall," remarked Ford.

"Well, I hope they all get the limit of game," said Bill Thorp.

"So do I," casually answered Smith, as though his mind was a thousand miles away from the subject. And then, after a few moments, he looked at Bill and then at Bob—who seemed to be puzzled at Smith's actions.

Finally Smith spoke:

"Do either of you scent any business in connection with that piece of news I read in the paper?" he asked.

"I don't exactly understand what you are driving at," answered Bill.

"Do you, Bob?" inquired Smith, as he looked over in his direction.

"It's too deep for me," came the reluctant reply.

"All right," said Smith, with a smile, and then he continued.

"What we have a greater need of in business today, perhaps more than almost anything else, is imagination. The only way we can gain it is by thinking about our work and about our problems.

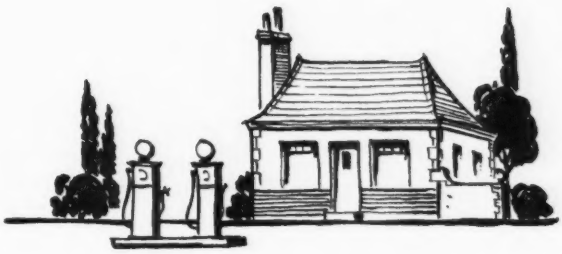
"Every man that owns or rents a gun must take care of it by cleaning it and oiling it. We have the oil right here in 4-ounce and 8-ounce cans. It's good oil and sells at a moderate price.

"However, there is a profit in every can that is sold—and we are here to figure out more ways and means for selling merchandise and for increasing the profits of the company. But—that is only a part of the story.

"It is human nature for every man with good red blood flowing through his veins to aspire for better things—better jobs with better pay—and the prestige and personal satisfaction that goes with progress.

"Suppose that each of you boys, here, figured out ways and means for selling more gun oil, fly-spray, cleaning fluid, harness oil, belt dressing, cream separator oil, and all those other spe-

A night scene at an Atlantic City service station of the Atlantic Refining Co. illuminated by Glow lantern floodlights



WHEN YOU BUILD THAT NEW STATION

When you build that new station insure its success before a single shovelful of dirt is turned.

Bring professional talent to bear upon those extremely important factors—*design* and *layout.*

Let your *plans* be complete; your *specifications* "air-tight."

And if your program is extensive, let *construction supervision* rest upon more experienced shoulders.

As consulting Engineers and Architects specializing in the gasoline and oil marketing field, The Archineers offer a highly credited service consisting of Design, Layout, Construction Supervision and Equipment Counsel.

Write for Brochure which describes the scope of our specialized service.

BULK STATION PLANS

Here, particularly, far-sightedness on the Architect's board may save thousands of dollars for you in the days when business growth demands further expansion.

THE ARCHINEERS

Architects *Engineers*

1307 Engineering Bldg., Chicago, Illinois

A Professional and Highly Experienced Service When You Need It—Without Necessitating Permanent Overhead the Year Around.

cialties we have for sale, than any other ten service stations in the entire division—or in the whole company, for that matter.

"What do you suppose would happen to you? You couldn't be held down here with a team of mules if your sales of the major products were also good. However, a sales record of that kind will never *happen*.

"It's brought about through the use of imagination in business and about business. If you think about a problem long enough—actually concentrating your thought—you will be able to work out a solution—whether it be a sales problem or some other kind of a problem.

"The average fellow thinks, 'What's the use of me working my head off when there are so many smarter men in the organization? I haven't a chance to beat the sales record of some of the men who have had so much more experience and who have a college education.'

"Listen to me, boys," continued Smith.

"The sales possibilities at our service stations are unlimited; but, the sales effort—mind you, I say sales effort—is not 5 per cent. Almost all the men go after business in the same manner you went after yours.

"In other words, they are obliging to those who come—giving them exactly what they ask for—but they are so afraid of offending customers that they seldom try to sell anything—not even the things that they actually need and buy elsewhere."

At that moment a new Chrysler coupe, with a young lady about 22 years old at the wheel, entered the drive.

Smith grabbed a can of cleaning fluid and stepped to the island, and as the car came to a stop he touched his cap and asked: "You want your tank filled with (blank) gasoline—our best premium fuel—don't you?"

"Why, I don't know. What is the difference between that and what I usually get?" inquired the lady.

"The newer high compression motors operate much more smoothly on this fuel than with any other kind. It eliminates knocks. Its use permits of an even flow of power applied to the head of the pistons—much more so than without it, and the results in comparison will almost astonish you."

"How much is it a gallon?" asked the lady.

"Only 22½ cents," was the reply.

"Well, I'll try it, then."

"This is something you might like to look over while I fill the tank and check your oil, etc.," remarked Smith, as he handed her the can of cleaner.

He filled the tank, checked the oil, filled the radiator and asked the lady if she would like to have the tires checked.

He said, "Your tires seem to be right up, but I shall be very glad to check them for you if you will drive over the air-stand."

"I don't believe they need any air as I had them all tested late yesterday afternoon. However, I thank you just the same. Now, how much do I owe you?"

"Ten gallons of gasoline at 22½ cents is $2.25. The can of cleaner fluid, if you should want that for removing stains and spots from dresses that are otherwise clean—or for cleaning ties, etc., is only 25 cents additional. It really is a handy thing to have in the house, but I wouldn't have you buy it if I wasn't sure you would be grateful to me for bringing it to your attention. In case you want it, the whole thing will amount to only $2.50.

"I'll take it," she said, as she handed him $2.50.

Smith, as usual, thanked her kindly for her patronage and invited her to come again.

Bill Thorpe and Bob Ford watched every move and listened to every word uttered by Smith as he cleverly but honestly and sincerely paved the way for the culmination of each sale. Of course, there were times when all the men were busy and there was no chance for the boys to hear all of Smith's presentations. However, they heard many of them during the course of two days.

The result was that the station sales grew as the suggestions were put into effect and the men gained confidence in their own ability to merchandise the full line without offending the trade.

All of this occurred in 1922. Today Smith is assistant manager of a division—and I presume he was chosen because of his ability and desire to be helpful to others. He was always in his glory when he was sure that he had awakened some young fellow to the possibilities of his opportunity—and when that was done—he didn't preach—he got right on the job with that young man and taught him what he knew. No man worked under him three months without becoming a good producer or getting out.

What's more, he never fired a man. He sold the fellow on the fact that he was probably misplaced and he'd quit of his own accord with a thankful feeling toward the company and Smith, too.

It may not be amiss to say that Bill Thorpe is now a service station superintendent at a salary increase of 100 per cent over what he was getting when Smith woke him up and helped him to help himself.

Bob Ford is now a highly prized territory salesman—the same territory covered by Smith before he was appointed assistant manager. Of course, this promotion brought with it additional pay along with the additional responsibility.

But the best part of it is that Bob has, for a long, long time, been considered one of the most resourceful and most studious salesmen in the entire division where he is employed.

Does it pay to think about your work? Does it pay to use imagination in business? Does it pay to take your work seriously—and then work?

Well, you just ask Smith—'er Bob—'er Bill—when you meet 'em.

Wittman Oil Co., Humbolt, Iowa, is placing on the market soon a Gasateria. E. C. Wittman, of the company, invented the gasoline pump which sells gasoline when the customer puts a 50 cent or $1 piece in the pump.

The Autocar Co., Ardmore, Pa., has appointed J. A. Donnelly manager of the Chicago branch of the company, succeeding E. F. Sayers, assistant sales manager, according to H. M. Coale, vice president in charge of sales.

ADVERTISING PAGES REMOVED

A modern service station of the Canfield Oil Co., in Cleveland, with three enclosed lifts. This station is of brick with stone trim, and is one of the latest stations built by Canfield. The delicatessen at the left is part of the station building, and the store room is leased

Points to Consider in Building One-Stop Service Station

By Gordon Johnston*

IN THE early days of gasoline marketing, sales volume was so small that the general store carried it as an accommodation to certain customers, but not as a profitable article. This condition continued until the advent of the automobile when the curb pump first made its appearance.

This type of equipment afforded a more convenient method of servicing the automobile and also proved quite valuable as an advertising medium, in that the pump indicated that the merchant owning it, was progressive and catering to the better class of trade.

As the automobile became increasingly popular, the repair shop and garage were conceived. Naturally, every repair shop had a curb pump and this method of servicing cars continued to grow in popularity until certain courageous oil companies decided to try out the idea of service stations.

The first stations were located generally on small corner lots with a small approach from each street. A small building of wood, sheet metal, or, in some cases brick, was provided for the attendants, for the storage of oils and greases and in many of the early stations, the gasoline pump was also placed on the inside of the station, with lines running out to the service point. It was only at the very busy stations that two pumps were located. Storage was provided for approximately two hundred and fifty gallons of gasoline, and if the station developed a large volume, five hundred gallon storage was installed.

It is interesting to note that in the first service stations built, the only service offered the motorist, or expected by him, was the delivery of gasoline and oil. Water was available at most stations on a "Help yourself" basis. The better stations provided air for tire inflation, generally on the same "Serve self" plan. The car owner either greased his own car, or paid a garage man to do so—if it was lubricated at all.

From this simple beginning the service station has progressed rapidly and today we find service stations conveniently located on main business thoroughfares, residential thoroughfares and along any paved highway.

The many different types of buildings and the varying layout of facilities would indicate a widely separated opinion on the question: "What constitutes the ideal service station?"

This is a question that must be answered by the owner's individual taste in architecture, the number and kinds of services which he desired to render, the potential volume of business to be obtained, climatic conditions etc.

We shall attempt in the following pages to stress certain points of fundamental importance and review briefly methods that have been successfully used by many large oil companies.

*Director of Sales, United States Air Compressor Co., Cleveland, O.

Interior of the lubrication department at the Canfield Oil Co. station. Portable grease guns are attached to the air lines for lubrication. Note that customers can drive off the pits, forward, and that the exit drive passes a pump island that may be seen at the right side of the photograph showing the exterior of the station

Location of Station

The location of the station is the first, and most important consideration. The selection of a suitable site should be governed by the amount of existing traffic and the probability of future traffic. Naturally, the street should be wide and well paved.

Corner locations are preferable for several reasons; first, all facilities are accessible from two streets; second, building and equipment can be seen to better advantage and from a greater distance; third, it is possible, on a corner lot, to lay out service points, building approaches and exits, in a smaller amount of space than when an inside location is utilized.

It is generally conceded that when the inside location (lot not located on corner) is used, a minimum frontage of 150 feet is necessary.

Location of traffic signals are important in the selection of corner lots, inasmuch as the entrance to the station on the main thoroughfare should be where the heavier traffic is stopped by the signal. The lot should be of such size as to allow locating of all buildings and equipment without crowding and to make some allowance for future expansion. A careful survey should be made to determine the potential sales volume to be had from neighborhood and also from transient trade.

Approaches and Driveways

All approaches should be laid out with the thought paramount of facilitating to the utmost the ease of entering and leaving station. It is most desirable to install approaches as wide as possible. Where local ordinances permit, it is suggested that approaches should be 35 to 40 feet wide, with minimum grade from street to property line. Such approaches permit customers to enter or leave station at higher speeds and also add materially to the general appearance of station.

Approaches should be built of concrete or asphalt. If concrete is used, these should be 8 inches in thickness, reinforced with 40 pound road mesh. If asphalt is used, a sub-base of concrete, 6 inches in thickness, reinforced as suggested above, should be laid, on top of this a topping of asphalt 2 inches in thickness should be laid.

Driveways should be built of such material as can be kept clean and not detract from station appearance. Concrete has been employed for this purpose by many companies in the past with more or less satisfaction.

It is noted however, that the trend is away from this kind of construction, due perhaps to the strain imposed upon operators who are forced to constantly walk on it, plus the fact that it is almost impossible to remove oil stains which inevitably appear on driveways.

The trend today would seem to be toward asphalt. It is resilient under foot and oil stains do not show. Replacement is easy should it become necessary to tear up driveways for repairs to oil or gas lines. This type of pavement can be installed at about one half the cost of concrete.

The cheapest type of driveways is the slag or crushed stone, which is constructed by first laying 6 inches cinder subbase, thoroughly compacted by rolling. Next, a top dressing of approximately 1½ inches of slag or stone, stone to be graded from one half inch to dust. This is also compacted by rolling.

This type of driveway can be kept in reasonably good condi-

ADVERTISING PAGES REMOVED

tion by occasional raking. One definite disadvantage to this type of driveway is the excessive amount of dust created which is not only objectionable to the station owner, but also to the neighborhood property owners.

Location of Gasoline Dispensing Units

The number of gasoline dispensing units to be installed should first be determined by the estimated gallonage of the station. The next determining factor, is the number of different grades of gasoline to be dispensed.

After determining the number of units necessary for present business, due consideration should be given future expansion.

The dispensing units should be so located as to permit direct approach from street to dispensing points and ease of exit without interference with other incoming or outgoing station traffic.

The dispensing units should be so located on islands as to permit a maximum number of cars to be serviced simultaneously with any of the brands of gasoline offered for sale at the station.

Where only two grades of gasoline are offered for sale, the so-called "tandem meter system" has become quite popular, due no doubt to the fact that it is compact and enables operators to dispense two grades of gasoline from each side of units.

Pump Islands

Pump islands are generally constructed of concrete and should be at least 8 inches above driveway level. Islands should extend from 6 to 8 inches on all sides of gasoline dispensing units to offer protection to units from careless driving.

Services to Be Rendered

Certain one-stop stations include services such as battery station, tire shop, restaurant and car washing—these in addition to the regular gasoline, oil and full lubrication services usually found in the modern service station.

It should be borne in mind that in all cases, proper provisions should be made for sales room, rest rooms for men and

AMERADA PETROLEUM CORPORATION

Producers of Crude Oil
Manufacturers of
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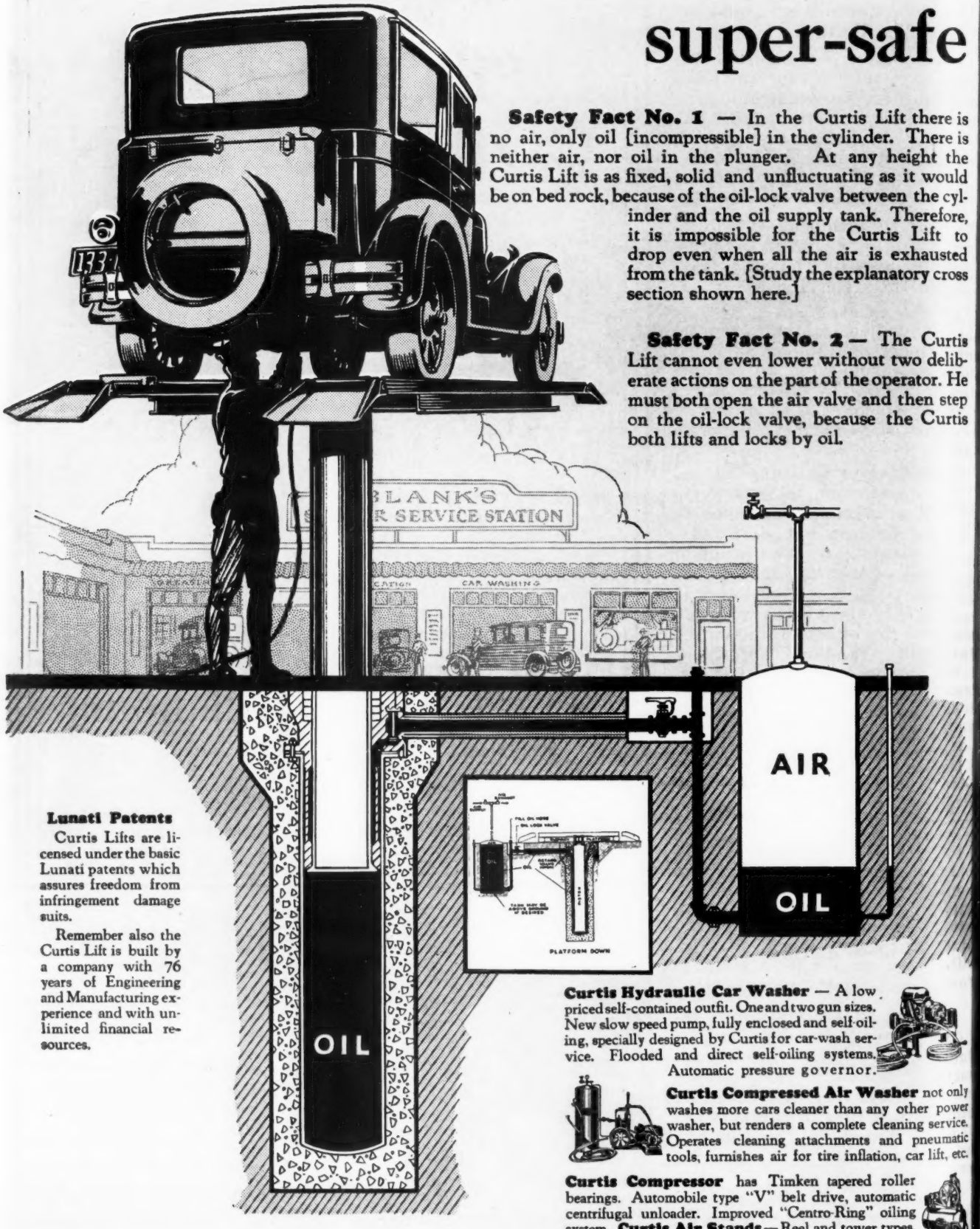
Tulsa, Oklahoma

Why the CURTIS super-safe



Safety Fact No. 1 — In the Curtis Lift there is no air, only oil [incompressible] in the cylinder. There is neither air, nor oil in the plunger. At any height the Curtis Lift is as fixed, solid and unfluctuating as it would be on bed rock, because of the oil-lock valve between the cylinder and the oil supply tank. Therefore, it is impossible for the Curtis Lift to drop even when all the air is exhausted from the tank. [Study the explanatory cross section shown here.]

Safety Fact No. 2 — The Curtis Lift cannot even lower without two deliberate actions on the part of the operator. He must both open the air valve and then step on the oil-lock valve, because the Curtis both lifts and locks by oil.

Lunati Patents

Curtis Lifts are licensed under the basic Lunati patents which assures freedom from infringement damage suits.

Remember also the Curtis Lift is built by a company with 76 years of Engineering and Manufacturing experience and with unlimited financial resources.

Curtis Hydraulic Car Washer — A low priced self-contained outfit. One and two gun sizes. New slow speed pump, fully enclosed and self-oiling, specially designed by Curtis for car-wash service. Flooded and direct self-oiling systems. Automatic pressure governor.

Curtis Compressed Air Washer not only washes more cars cleaner than any other power washer, but renders a complete cleaning service. Operates cleaning attachments and pneumatic tools, furnishes air for tire inflation, car lift, etc.

Curtis Compressor has Timken tapered roller bearings. Automobile type "V" belt drive, automatic centrifugal unloader. Improved "Centro-Ring" oiling system. **Curtis Air Stands**—Reel and tower types.

Lift is at *all heights!*

Safety Fact No. 3—The oil-lock and air operating valves on the Curtis Lift are out from under the lift. No one can operate the lowering mechanism intentionally or accidentally while under the lift.

Safety Fact No. 4 — An automatic retard valve restricts the outflow of oil and mechanically controls the lowering of the lift at a safe, predetermined speed, independent of the operator.

Safety Fact No. 5—The Curtis Lift is as super-safe structurally as it is in its operating principle. The platform spider is structural steel in "X" form, the strongest construction known to Engineering. No castings with the possibility of blow holes, cold shuts or hidden defects. The structural design has been tested to stand 400 to 500% of the weight or strain that can be normally put on it with a heavy automobile. No Curtis Lift has ever had a structural break or collapse.

Safety Fact No. 6—In the Curtis Lift the packing gland is at the top of the cylinder, easily accessible for adjustment and where the need of adjustment can instantly be seen. Contrast this with a lift that has internal moving or wearing parts in the cylinder or plunger, buried under ground or otherwise inaccessible. The Curtis Lift has no leather cup on plunger to wear, replace or which is impossible to inspect.

Safety Fact No. 7— The Curtis platform is made so the attendant cannot get toes under the edge when it lowers. Even the ends are hinged as an additional safeguard.

Send for the Curtis Lift catalog which illustrates and describes its construction in every detail. Your own good judgment will tell you then what lift to buy.

CURTIS
St. Louis

Curtis Pneumatic Mchy. Co.,
1965 Kienlen Ave., St. Louis—518-X Hudson Term., N. Y.

Please send catalog and information about [State product you are interested in]

Name_____

Address_____

CARE WILL SAVE YOUR CAR

women together with storage and equipment room.

Layout and Location of Facilities

Where site will permit, it is highly desirable that all departments should be enclosed in one structure, bearing always in mind at this point that next to an efficient and well planned arrangement, comes the attention commanding value of the station and its appeal to the passing motorist.

A point of paramount importance is that of arranging lubrication and other facilities to permit easy access from gasoline dispensing units, assuming always that the majority of customers are first attracted to the station by the need of gasoline.

While this service is being completed, another attendant should be using his best efforts to sell customers on complete lubrication, oil changes, battery inspection and other services afforded.

Layout of building should be such as to present to the view of customer as many of the services provided as possible. Whenever size of lot will permit, it is highly desirable to so layout building as to permit the customer to drive through the service departments, entering from the front and leaving by the rear, thus eliminating the necessity of backing out and congesting station's thoroughfare.

Rear driveways should be arranged to route the customer around building and to pass gasoline dispensing units, to insure against loss of this business if he has not purchased gasoline before securing other services.

Types of Buildings

A careful study of the different types of buildings used in the different parts of the United States and Canada indicates that there is a wide difference in opinion on this subject. These buildings range from the neatly designed wood construction favored in certain small towns and rural localities, to the moderately priced brick and stucco designs used in cities of smaller size and suburban locations.

Next comes the elaborately designed super station of stone,

brick or stucco. These are located in the better residential sections and on main thoroughfares of the larger cities.

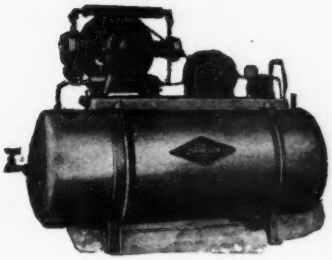
Much discussion has centered on the question of "how to properly determine the amount of money to be expended on a building." This should be determined by a careful study of potential business. Next, by considering the necessity of a building to harmonize with the neighboring architecture. In any case, the investment should not exceed an amount that can be amortized over a predetermined period, variously estimated at five to ten years, at the same time allowing for a suitable profit.

The type of architecture and design is largely a matter of personal taste. It is possible to obtain some charming results by the use of stone, stucco, brick, wood, terra cotta or marble. In the majority of cities the kind of construction acceptable is more or less dependent upon the local building code. It is noted that practically all present codes object to the use of wood construction for this type of facility.

Among the major requirements listed in most codes are masonry exterior walls, steel sash for all window openings, fire resisting roof covering and fire resisting ceiling.

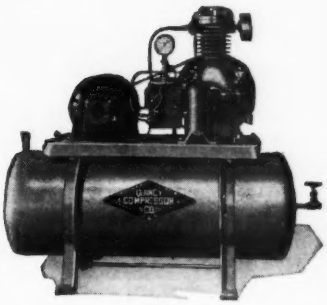
It is noted that many companies seem to favor the use of salt glazed or enamel brick or tile for all interior walls. This is due to their attractive appearance plus the ease of cleaning. In those cases where the owner

A suggested ground plan for a complete one-stop station designed by the author of this article, Gordon Johnston. Note especially the wide driveways; location of the air standards and light poles; the three display windows, that by the brake testing department being three feet wide for tires; and the grouping of departments. This plan was designed as a guide for the jobber contemplating a one-stop station, and the arrangement is such that any number of departments could be included, or the jobber could start with a few departments and add as business warrants other services. The lot is 150 by 140 feet



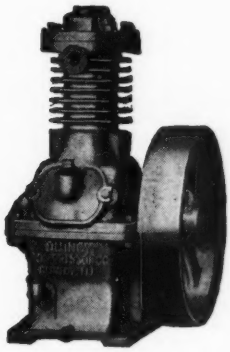
Model G-18

Two-stage, fully automatic. Displacement, 3¾ cu. ft. with ½ h. p. motor, 4½ cu. ft. with 1 h. p. motor, 6 cu. ft. with 1½ h. p. motor. Tank, 20 x 48, 65 gallons.



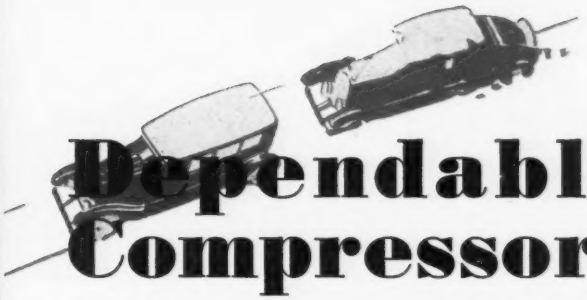
Model F-1

Complete automatic air cooled unit. Size, 2½ x 2½ in. Cut off pressure, 150 pounds. Displacement, 2.8 cu. ft. with ½ h. p. motor, 4.2 cu. ft. with ¾ h. p. motor, 3 cu. ft. with ¾ h. p. gas engine. Tank, 14 x 36 in., 24 gallons.



Model A

Air cooled. Six sizes, from 1¼ x 1½ to 4½ x 5. Displacements from 1 to 27 cu. ft. Loose or V type pulleys as regular equipment.



Dependable Compressors

Your air-compressor is one of those things you would like to install and forget, certain that you will always have all the air you want, when you want it.

Quincy Compressors closely fit that ideal because they are designed to give that result. Maximum efficiency with the very minimum of attention. And the operating cost is remarkably low.

Quincy Compressors

There are 14 sizes, air cooled and water cooled — a size and type exactly suited to every Service Station, Garage and Shop requirement.

You will save money and trouble, in the long run, by installing a Quincy. Complete information for the asking. Write or use the coupon below.

MAIL THIS COUPON

QUINCY COMPRESSOR CO.,
223 Maine St., Quincy, Ill.

Please send complete information about Quincy Compressors, for use as follows:

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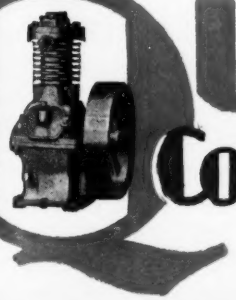
Name.....

Address.....

City.....*State*.....



QUINCY Compressors

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Also in other important centers

N-4

A modern seven-lift station of the Standard Oil Co. of Ohio, in Cleveland, opened late last month. Three lifts are in one wing, four in the other

does not care to go to this expense, common brick or smooth building tile is employed. This is usually painted.

The ceiling construction generally favored is plaster on metal lath or composition board.

The floor most commonly used is of concrete construction, either in its natural color or used with a color mixed in the concrete to suit owner's individual taste. Where concrete floors are used, it is advisable to use some approved method of hardening floor to prevent the penetration of oil, grease etc. In the more elaborately finished stations, the floor finish generally employed is floor tile.

The interior finish of sales and rest rooms is usually in conformity with that used in other portions of the building, although in some cases the ladies' rest rooms are somewhat elaborately finished in either plastered walls painted or by the use of California stucco. It should be noted at this point, that whenever possible, both an outside and inside entrance to ladies' rest rooms should be provided.

An equipment room should be provided to accommodate the boiler, hot water heater, high pressure grease equipment, air compressors and other necessary equipment. This room should also provide toilet facilities and lockers for the exclusive use of attendants.

In most modern service stations the maximum number of window openings are provided in all exterior walls in order to allow maximum of light and ventilation. These windows are usually placed about 30 inches above the floor level.

The doors opening into service departments are in almost all instances the rollup or overhead type. These can be obtained in almost any desired architectural effect and with as many glass panels as owners desires.

The sales room should be of such size as to permit sufficient room for desk, display of package merchandise, with room for bulk oil containers.

Rest rooms, sales rooms and all working spaces should be properly heated during cold weather. A survey discloses that steam heat, with the use of unit heaters, is most popular.

Many companies favor an overhang or canopy over driveways and islands at front of building, as a protection to customers and attendants in inclement weather. This is largely a matter of choice, although such construction lends itself particularly well to certain types of architecture.

Gasoline Dispensing Units

There are many types of gasoline dispensing units available, and there is much discussion on the point of which type is most efficient. The three most popular methods being used in different parts of the country are; first, the visible bowl, hand or electric operated pump of 5 or 10 gallons capacity, the hand operated, blind pump or meter pump; the electrically operated meter system.

The trend is much toward the last named unit. This unit is built in various types of cabinets and consists of meter, gasoline pump, motor etc. The points in favor of this type of equipment are speed of delivery, accuracy of delivery and attractiveness of appearance. Experience shows that it is possible to serve about three times as many customers with this type equipment as with the hand operated pump.

Tankage

In the majority of the larger stations, gasoline tanks range in size from 1500 to 3000 gallons. The size of tankage is determined by potential business of station, the capacity of the trucks delivering gasoline to the station and the time elapsing between deliveries. Tanks should be so located as to prevent obstruction of drives and service facilities during the delivery.

Oil Dispensing Equipment

The most popular method of storing and dispensing oil seems to be the use of narrow lubricating tanks. These tanks accommodate from 30 to 75 gallons of oil and are equipped with manually operated pumps.

A sufficient number of these containers should be provided

in the service department where they are quickly available to the lifts or pits, while another battery should be provided in the sales room for the servicing of cars stopping at islands.

In some cases storage facilities are provided for oil on the islands, either in the small narrow containers already described, or in a more elaborately designed oil pressure system.

Greasing

There are various types of high pressure lubrication equipment, beginning with the hand operated gun. Next, the self-contained, air operated gun, which contains about a quart of grease on which full line air pressure is exerted.

Next, comes the self-contained, electrically operated gun. These are generally of 15 to 25 pound capacity and are equipped with a small motor directly connected to an air compressor which compresses air on top of the grease, forcing it through hose booster pump and then to fitting.

Next, comes the centralized greasing system which consists of a large container located usually in the equipment room. To this container is usually connected a motor driven pump, which forces the grease from container into lines leading up to dispensing points, beside lifts or in pits.

At this point a booster gun is installed. These guns can be suspended from ceiling reels or housed in specially constructed pits. When grease reaches these guns, it is boosted to the necessary or desired pressure by means of air and thence to the fitting on car.

The type of equipment to be used must be determined by the number of service points. The larger stations seem to generally favor the centralized system.

In addition to the high pressure lubrication, each station should be provided with either a hand or electrically operated grease gun for the servicing of differentials and transmissions. In view of the pending ruling, requiring all grease to be measured as it is delivered, it would seem highly advisable to purchase one of the available types now being offered and equipped with meter.

Many service stations are also offering free flusher service to their customers. There are a number of these devices available, the function of which is to thoroughly flush out and remove old grease from differential and transmission. This service is much appreciated by the motorist and enables the station to appreciably increase grease sales.

Crankcase Draining

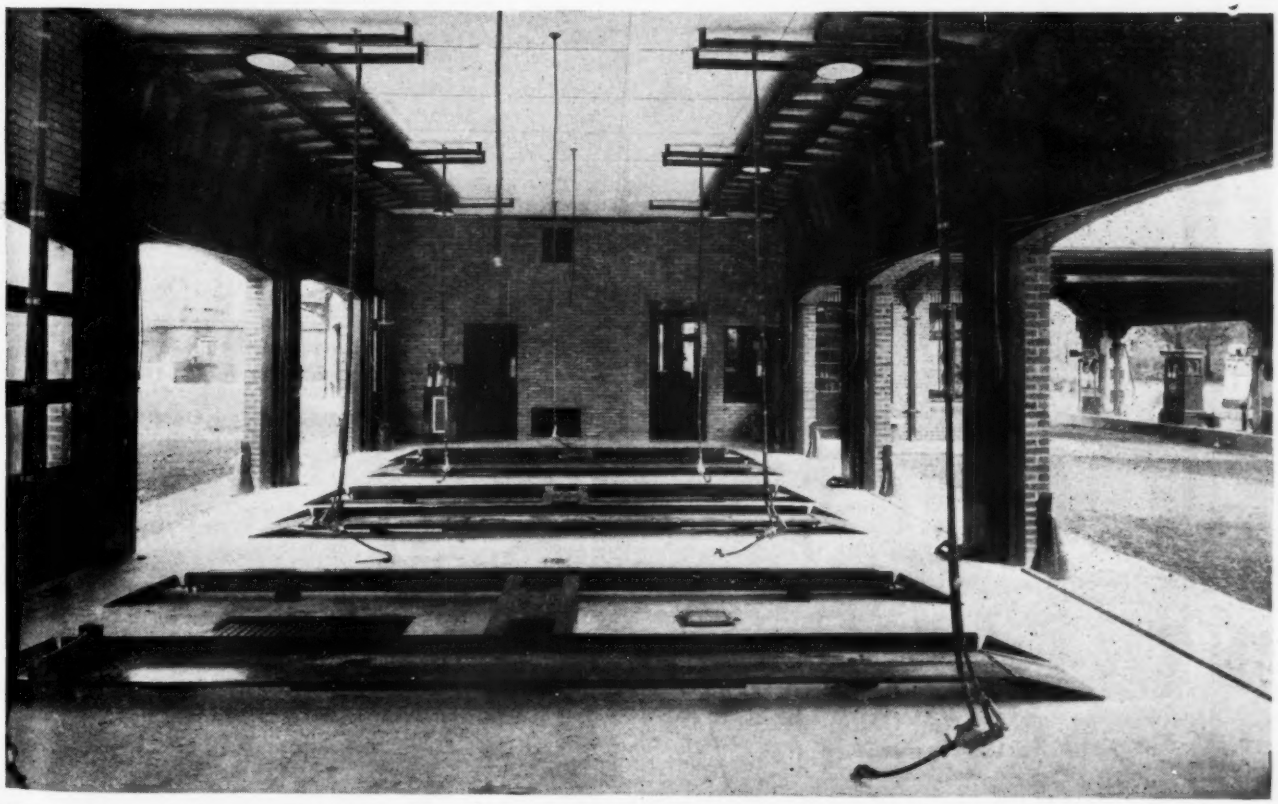
Arrangement should be made beneath each lift or in each pit to allow quick draining of crankcase. This is accomplished in various ways, one of the more popular being the collapsible tube type which carries the old oil into a central refuse tank buried underneath the ground.

Spring Spraying or Oiling

The proper lubrication of springs is most important. It can be accomplished by means of a spring sprayer which is connected direct to an air line and atomizes oil as it is driven against springs, or, with the low pressure, air operated unit which carries a fine stream of oil direct to springs.

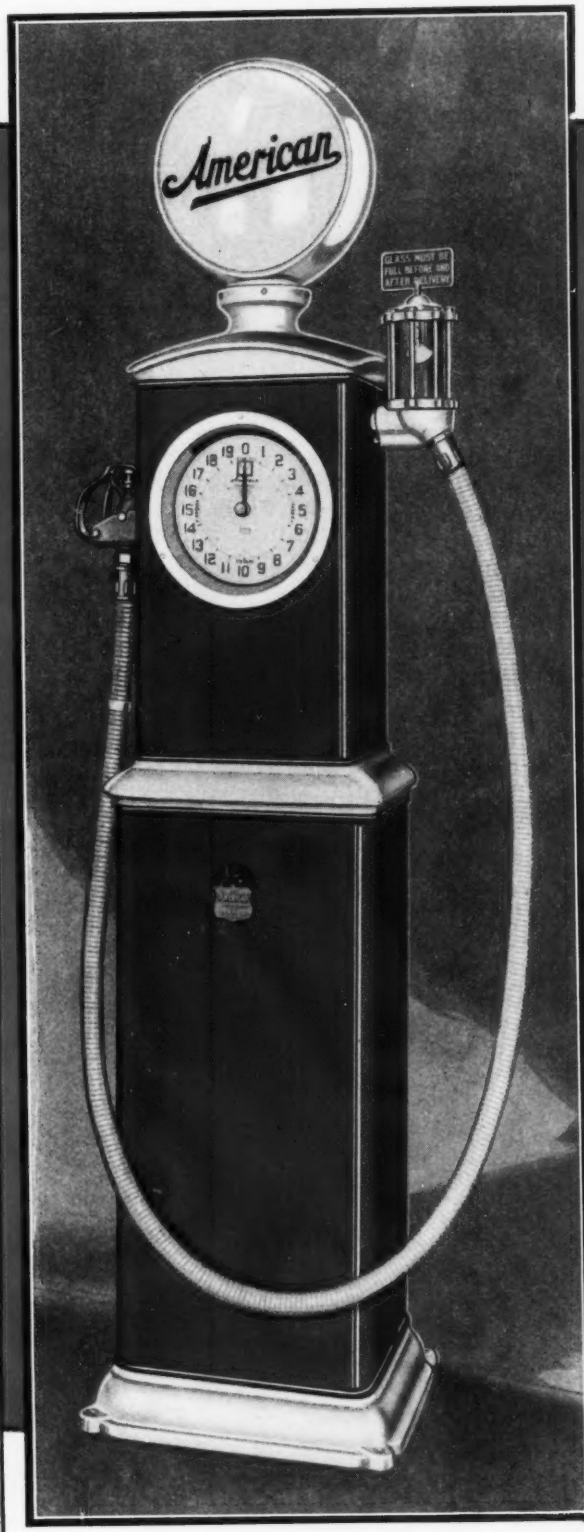
Air Stands

There are a number of different types of air stands available. First, is the conventional type air tower, which inflates the tire without measuring the pressure.



The interior of the four-lift lubrication room at the accompanying Standard of Ohio station. Note that the lifts open onto a drive at the rear, so customers do not have to back their autos into the drives at the gasoline outlets

"MAJESTIC" CABINET

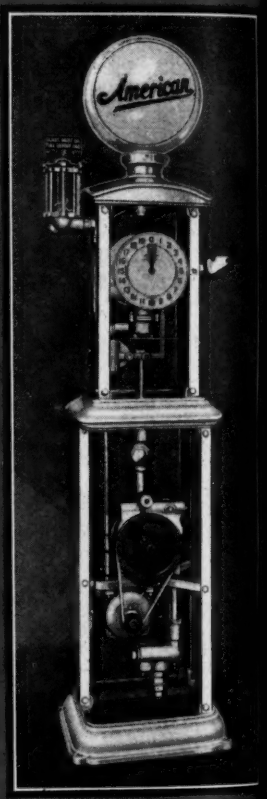


CUT 237

AMERICAN METER

WITH

BELT DRIVE

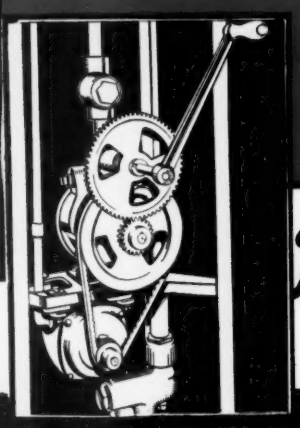


Quiet, free from vibration!
Smooth in operation!
Complete equipment!

The new V-belt drive works like a charm. The Unit operates smoothly . . . silently . . . noise and vibration are conspicuous by their *absence*! No quieter Unit is possible.

In operation . . . regardless of whether nozzle is open or shut, here is one meter outfit that doesn't know the meaning of "jingle-jangle" noise . . . no disturbance to motorist or operator . . . big modern-day gas tanks filled speedily in one operation free from effort, free from noise, even free from vibration.

The slow speed large capacity pumping Unit is a "wiz" . . . positively nothing better . . . rotates at only 420 r.p.m., which insures a Unit of *long life*. Very efficient on relatively high lifts and long draws.



Rotary type pumping Unit connected to motor by V-belt drive. Mechanism protected by efficient screening. Geared hand attachment if desired.

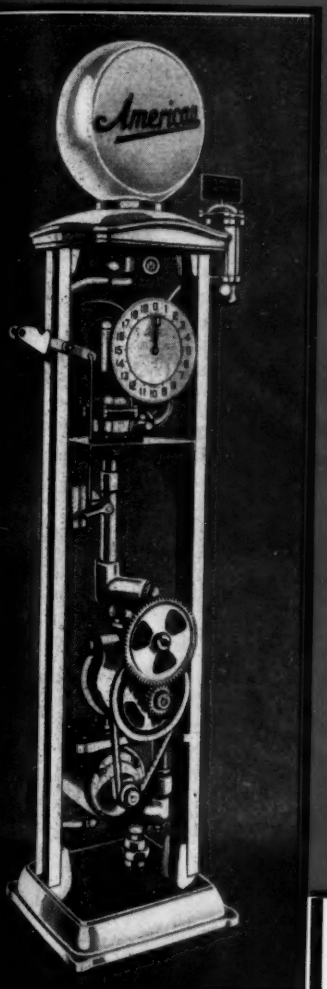
Write today, advising your requirements

The AMERICAN OI[illegible]
1713 DALTON ST. CIN

PRESTO SERVUS PUMPS

"STRATE-WAY" CABINET

Best-looking outfits!
Best performing outfits!
Best-*selling* outfits!



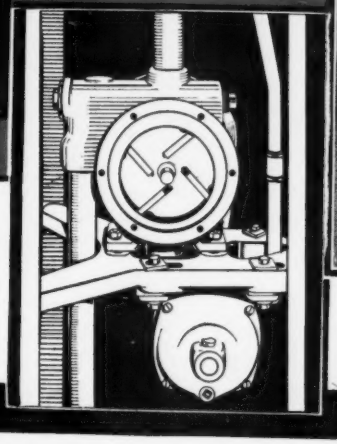
These pumps have the smart, inviting *appearance* that flags motorists and hails them to your stations . . . they *perform* so well that q-u-i-c-k fill-the-tank service is assured . . . and they *do* do a good job of *selling*.

Both pumps illustrated ("Majestic" on opposite page and "Strate-way" on this) are big, gracefully-proportioned, massive in construction and pledged for Service to the fullest extent of the word.

The "Strate-Way" Cabinet embodies all the desirable mechanical features of the higher-priced "Majestic," including V-belt drive, slow speed Pumping Unit and other features. In short, a fine quiet job, a complete job, a job that will add prestige as well as dollars, to your station.

Slow speed 4-blade pumping unit . . . 420 r.p.m. . . with built-in bypass valve. All vital parts immediately accessible when face plates are removed.

Write today, advising your requirements



UMP & TANK CO.
CINCINNATI, O.

CUT 207

Next, is the automatic measuring type. By the use of these, the operator sets hands or scale to the required poundage and applies the chuck. Signals, such as bell, whistle or pulsater continue until the desired pressure is obtained.

A sufficient number of stands should be located in yard of station to permit easy accessibility from any point. Air lines should also be available at pits or lifts in order to permit attendant to check customer's tires during a complete lubrication job.

Water

Water should be located at convenient points, near gasoline pumps, which allows attendant to check water level while car is being serviced with gasoline. Perhaps the most popular way of filling radiators today is by means of a compression faucet attached to end of hose. This allows operator to place faucet in radiator, opening by pressing the compression lever and releasing when filled.

Light

Particular care should be given the subject of light. The first point to be remembered is, that the station and yard should be lighted with a more intense illumination than afforded by the light on street adjoining station. This for the obvious purpose of spot-lighting the station.

The most popular form of yard lighting is obtained by the use of flood lights. There are many types of these lights, some of which are made in the highly ornamental lantern types. The exterior face of the builder is generally illuminated by suitable lighting arrangement consistent with design of building.

This is quite frequently accomplished by means of eave lighting where roof or cornice overhangs the exterior wall—if this type of construction is not used, this effect can be accomplished by suitable light fixtures.

It is most essential that all approaches and islands be well lighted, both in the interest of the customer, pedestrian and the attendants. Great care should be taken to obtain these lighting effects without glare.

Suitable lighting arrangement should be made in all service departments and special lights should be placed in pits or under lifts to facilitate work done in the evening. Needless to add, all interior fixtures should be vaporproof.

Illuminated Signs

It is observed that practically all companies favor illuminated signs. Such signs should be conspicuously placed to attract customer attention to the station and they can also be used to advantage in advertising the brand name of gasoline and oil, or other services.

Lubricating Charts

As a guard against oversight and to insure proper treatment of all points of lubrication on chassis, a number of companies are installing lubrication charts. These can be conveniently hung in the pits or along side of lifts, and act as a valuable check for attendants.

Pits and Lifts

There is a considerable difference of opinion on the subject of lifts versus pits, although lifts are rapidly taking the lead and are generally favored in all parts of the United States.

It is generally conceded by engineers that there is no economy to be effected by the building of pits—in order to build a good pit, it is necessary to expend as much or more money than to purchase and install a lift. Pits became quite popular with the advent of the greasing palace or lubritorium. However, they are becoming less popular for this use.

The disadvantage of pits lies in the fact that they are difficult to keep clean, they are poorly ventilated, they increase the fire hazard and set up a resistance with women drivers who dislike to drive over a hole in the ground, fearing that they will miss the proper channels and drop their car into the opening.

Lifts

There are a number of different type of lifts manufactured. The most popular is the single post, rotating type. When lifts were first introduced, there was considerable resistance due to the fear of many people that there was a possibility of falling. This resistance has been pretty well overcome.

The general public now understands that in a properly constructed lift of reputable manufacture, the full weight of the car is resting on a body of non-compressible oil and that it is impossible for the lift to descend until control mechanism is opened.

Lifts possess many advantages, among which is the fact that the operator is permitted to work on floor level and standing in a natural position. He has the advantage of more natural light and greater freedom of motion. Lift also permits the customer to walk under his car and see lubrication properly completed. Many customers are much interested in this angle, but would not consider entering a pit.

It is interesting to note that lifts are being almost generally used in grease palaces or lubritoriums. It is found that these lifts are seldom rotated. The customer either drives through service building or backs off of lift. In such cases lifts are ordinarily placed 10 feet 6 inches to 11 feet on center. It is generally conceded that lifts possess a decided advertising value and attract the attention of the passing motorists.

Landscaping

Some beautiful effects have been obtained by the proper landscaping of service station lots. It would seem highly desirable to do this in all cases because of the additional eye value obtained. Landscaping does not have to be of the expensive type—some of the most beautiful effects obtained are by the combination of grass plots and hardy flowers.

Personnel

It is a generally recognized fact that regardless of the money expended on service station site and building, little or nothing has been accomplished or can be, without the proper man power.

This subject has been intensively studied by most of our large oil and gasoline marketers throughout the country, with the result that many companies have now instituted a rigorous

PENNSYLVANIA SHARPLES STOCKS FREE FLOWING AT ZERO

Viscosities	Pour Tests
60/65 @ 210	Below 0° F.
75/80 @ 210	" 0° F.
90/95 @ 210	" 0° F.
110/115 @ 210	" 0° F.

These oils are refined and dewaxed to the highest standards of Pennsylvania Motor Oils exclusively from choicest Pennsylvania Crude.

Thereafter, these oils are subjected to a special processing by methods resulting from extensive research on the part of our laboratories and on which patents are now pending. This exclusive processing not only lowers the pour test to permit the oils to flow freely at extremely low temperatures, but enhances their lubricating qualities at all temperatures.

The exceptional merit of these oils is testified to unanimously by those of our trade who have lent us every co-operation in the perfection of these processes during the last three years.

TANK CARS ONLY

FRANKLIN CREEK REFINERY
at Franklin, Pa.

DAUGHERTY REFINERY
at Petrolia. Pa.

ADDRESS ALL COMMUNICATIONS TO

W. H. DAUGHERTY & SON REFINING CO.

at either

114 Fifth Avenue
New York, N. Y.

or

820 Tower Court
Chicago, Ill.

course of training through which all prospective service station attendants must pass and make a passing grade.

The object of these courses should be to familiarize the prospective attendant with the brand of the products he is about to sell, the correct manner in which to approach customers, proper method of servicing cars and the general conduct of the station. This training is of particular moment and if properly completed, does much to impress the customer with the standardized service being rendered by the same company whether in New York or Philadelphia.

Uniforms

It would seem highly desirable to uniform all attendants. There is a wide variety of uniforms available, but there seems to be a preference toward the neat dark colored whipcord breeches, leather puttees, dark shirt, sweater and cap.

The importance of the appearance and actions of the attendant cannot be overestimated. The attendant is the contact point between his company and the customer, and based on the impression he creates, the customer's future patronage can be measured.

It is particularly commendable to note that many of the large companies begin the training of all new employees in their service stations, promoting them into other branches of the company as openings occur and their fitness is proved. This system offers a real inducement for the attendant to put forth his best efforts.

In the larger one-stop stations one man is placed in charge of a certain number of attendants to service customers for gasoline and oil. In addition to these attendants, managers are placed in charge of other service departments, such as the complete lubrication, tire shop, etc. Lifts are manned by attendants specially trained in this branch of the business.

Pharis Tire and Rubber Co., Newark, Ohio, has issued an elaborate pamphlet dealing with the selling of tires by oil companies.

ON THE LAZY BENCH

Hustling

It was a dark alley in one of the worst parts of the town. Three men were waiting. One of them pulled a slouch hat down over his eyes and said: "D'ya see him?"

Another took a quick peek around the corner. "Yes, here he comes," he hissed.

The man with the slouch hat picked up a short thick section of pipe. Another took a heavy wrench and the third grabbed a smaller wrench that was none the less effective in close quarters.

"All right, fellers, let's go," one whispered.

And thus, when the boss got around the corner he found his three plumbers busily at work.

—The Vent

* * *

The Result of Education

"How old are you?" inquired the visitor of his host's little son.

"That is a difficult question," answered the infant prodigy. "The latest personal survey available shows my psychological age to be 12, my moral age 4, my anatomical age 7, and my physiological age 6. I suppose, however, that you refer to my chronological age which is 8. That is so old-fashioned that I seldom think of it any more."

—Pure Oil News

* * *

Ministers sometimes make pretty bad breaks. One officiating at a funeral was eulogizing the departed, and he concluded with these words: "Friends, all that remains here is the shell—the nut has gone."

—Texaco Topics

* * *

Remember, when a man has a deep scar on his right arm he is not necessarily a veteran of the great war. He may have got it reaching for the butter.

—Union Oil Bulletin

* * *

Mother: "After all, he's only a boy, and boys will sow their wild oats."

Father: "I wouldn't mind if he didn't mix in so much rye."

—The Gas Line

She Missed a Swift One

The scene was laid in a Kansas City, Mo., street car during the rush hour and the cast of characters consisted of a package-laden man sitting meekly in a seat, a fat, domineering woman who boarded the car and any number of amused passengers. The man had his foot in the aisle a short distance. The woman put her 180 pounds of displacement squarely down on it, drawing an involuntary exclamation of pain. Looking down at the man, she exclaimed impatiently, "Why don't you put that big foot of yours where it belongs?" To which he replied meekly, "Don't tempt me, madam, don't tempt me."

—The Gas Line

* * *

Assistant: "Have you no account with this house, madam?"

Customer: "No, but maybe I can arrange matters with your manager."

Assistant (to manager): "A lady of no account to see you, sir."

—Texaco Topics

* * *

A team of Americans has just beaten a British team in an international bridge tournament. London bridge is falling down.

—Union Oil Bulletin

* * *

"Brother Jones," said the deacon, "can't you-all donate some small contribution to de fund for fencing in the cullud cemetery?"

"I dunno as I can," replied Brother Jones. "I don't see no use in a fence around a cemetery. You see, dem what's in there can't get out, and dem what's out sho' doan wanta get in."

—The Vent

* * *

The novice at trout fishing had hooked a very small trout, and had wound it up until it was tight against the tip of the rod. "What shall I do now?" he yelled excitedly, and his more experienced friend replied, "Quick, climb up the rod and stab him."

—The Booster

ADVERTISING PAGES REMOVED

Newspaper Gasoline Advertising in '30

Old Copy Ideas Discarded, Study of Hundreds of Newspapers Brings Out, and Gasoline Advertising Today Ranks in Appeal with That of Many Other Products

By The Observer

NEWSPAPERS continue one of the leading mediums employed by petroleum marketers to advertise gasoline. The principal reason being that with few exceptions, the petroleum companies operate sectionally rather than nationally. Hence, it's only natural that the local mediums like newspapers are used.

According to the Year Book of Sales Management Magazine some 36, 196,760 lines of newspaper space was filled by petroleum companies in 1929 to increase the sales of their products. That represents a lot of white space. Of course, it's hard to determine what percentage of 36,196,730 lines was devoted to gasoline advertising exclusively, but it's safe to say the greater percentage was given over to it.

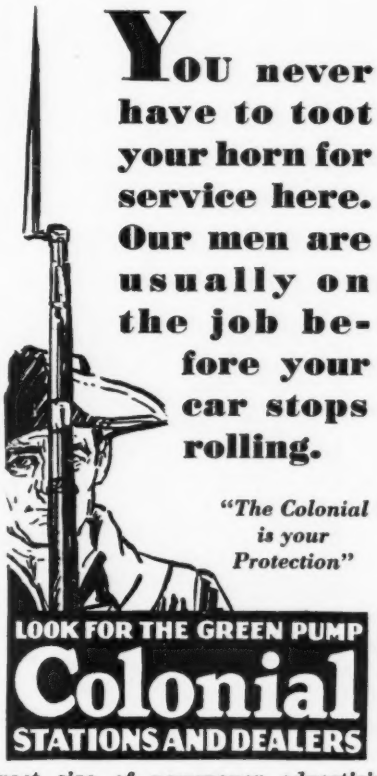
Certainly the use of such a tremendous amount of lineage in one year is evidence the petroleum industry considers newspapers one of the most effective mediums to carry their gasoline sales message.

Having purchased so much space, how do the marketers fill it to make it worthwhile to give this space the necessary life to help them increase their gasoline gallonages. That's the important question, and the purpose of this artcle.

In the old days, the fact that you advertised at all was sufficient to help increase your sales, regardless of what you said in your advertisement. Not so today. Far from it. That you should advertise your gasoline is taken for granted. How you should advertise is the all-important point in making your advertising really effectve.

Competition for attention today in the newspaper is just as keen if not keener than the competition for the motorists gasoline dollar. No longer are newspapers thin sheets with few advertisements. Today, newspapers, especially in the larger cities, contain many pages not only of smart advertisements but live news.

For example, contrast the present newspaper with the one of even a few years ago. There were not as many stories con-

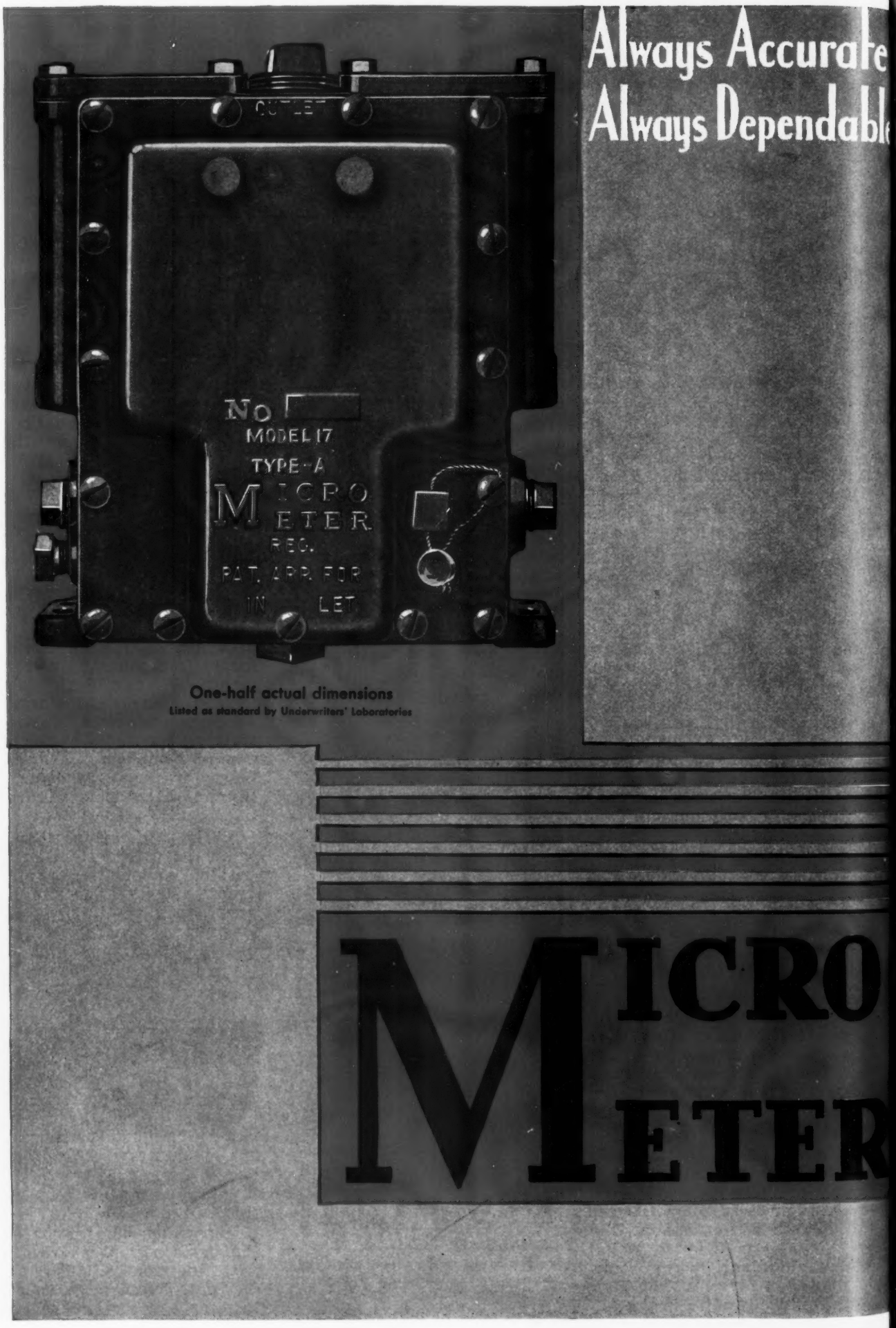

YOU never have to toot your horn for service here. Our men are usually on the job before your car stops rolling.
"The Colonial is your Protection"
LOOK FOR THE GREEN PUMP
Colonial
STATIONS AND DEALERS

Exact size of newspaper advertising carried by the Colonial Beacon Oil Co., Boston, daily from March to August, in papers in its territory

stantly breaking then to distract the reader's attention. There were no continual reports of great air achievements; no sharply drawn political discussions to split the country; no photographs by wire; no transatlantic telephone interviews; Mr. Capone and his boy-friends were not jumping into the headlines, and there was no radio-program page to be devoured. Simply straight news from the usual sources, and several pages of drab department store and local merchants' advertisements. We say "drab" because in yesteryear local stores' advertisements were day-to-day stuff, set hurriedly by the newspapers' composing departments and with little regard for making an advertisement distinctive.

Without question, then, the competition for attention for a gasoline advertiser was not great. If he gave the newspaper an advertisement set by an outside typographer it stood out 'mid the then not sensational news columns and certainly shone above the hurried newspapers-set local store advertisements. But today, with the many sensational news stories, and the professional local store advertisements which no longer are prepared hurriedly nor set by the newspaper, the petroleum advertiser has to step to catch the reader's eye.

However, in closely reviewing the gasoline newspaper advertising which has appeared in the eastern papers during the past nine months, it is apparent the petroleum advertiser has kept pace with the great com-


Always Accurate
Always Dependable
OUTLET
No
MODEL 17
TYPE-A
MICRO METER
REG.
PAT. APP. FOR
INLET
One-half actual dimensions
Listed as standard by Underwriters' Laboratories
MICRO METER

he Micro-Meter is shipped from the
actory sealed and calibrated and
equires no further calibration, regard-
ess of the nature of the installation,
ravity of the liquid, the height of the
uction lift, operating pressure or fric-
ional load, and retains its calibration
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s accuracy is not affected by varying
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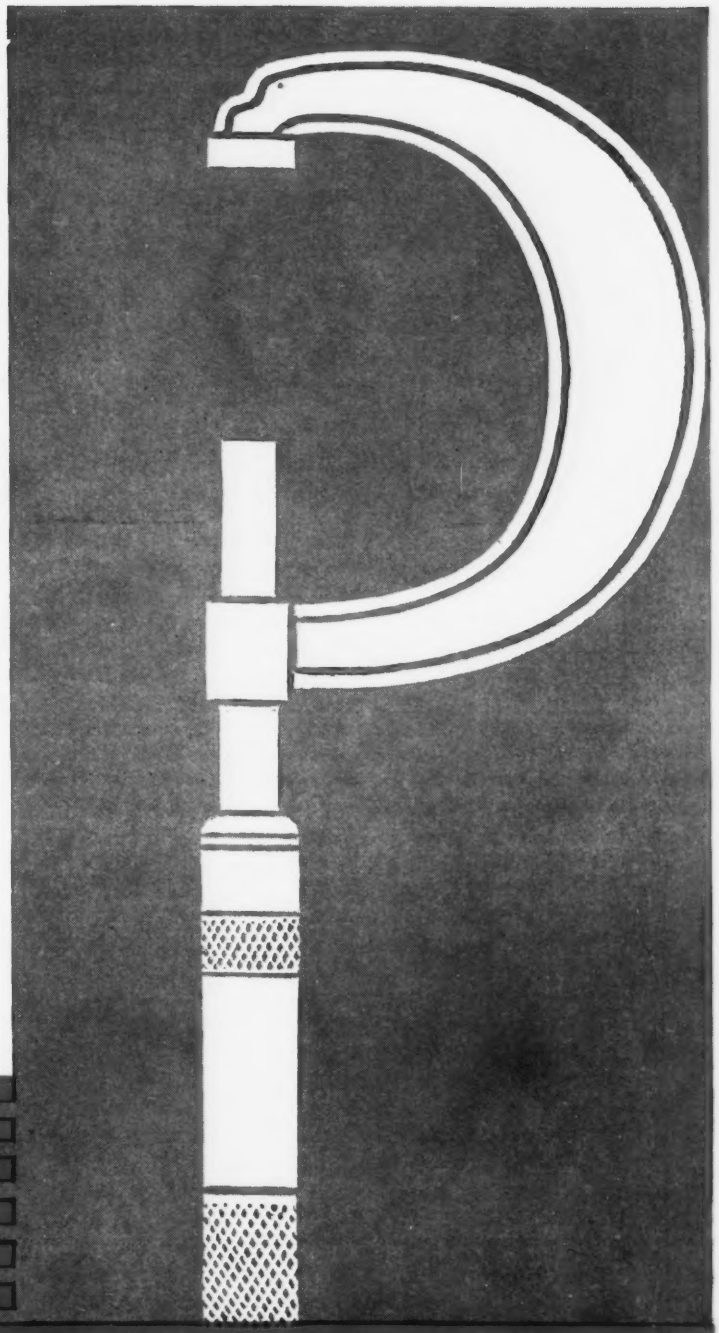
NATIONAL PIPE PRODUCTS CORP.
OCHESTER - - PENNSYLVANIA



with the
accuracy
of a MICROMETER...

FAMOUS KNOCKOUTS OF HISTORY... by Feg Murray
BUT IT ONLY TAKES ABOUT 75 SECONDS FOR TYDOL WITH ETHYL TO KNOCK OUT THAT KNOCK IN YOUR MOTOR.
JOHN L. SULLIVAN KNOCKED OUT JAKE KILRAIN, IN 75 ROUNDS. RICHBURG, MISS. JULY 8. 1889
ABSOLUTELY KNOCKLESS
HI-TEST TYDOL with Ethyl
A new and improved SUB-ZERO KNOCK-RATING Gasoline
Here's news . . . Bad news for the knock!
Good news for you! For Hi-test TYDOL with ETHYL is a new gasoline that makes motors absolutely knockless! No hill can make it knock. Sand or mud can't make it knock.
Broiling summer heat can't make it knock. No driver—careless or careful . . . can make it knock . . . Test this challenge to the world with a 10-gallon trial filling . . . Y-O-U C-A-N N-O-T M-A-K-E I-T K-N-O-C-K!
Made by the makers of Veedol Motor Oil . . . used by the Graf Zeppelin and the Byrd Expedition.
TIDE WATER OIL SALES CORPORATION . . . 17 Battery Place, New York City
IT'S A KNOCK-OUT!

One of the Famous Knockouts of History gasoline advertisements used effectively by the Tide Water Oil Sales Corp.

petition for attention in the newspaper columns. There has been a distinct breakaway from the old style of gasoline advertising and a deliberate attempt by the leading marketers to tell their gasoline sales story in a new and vivid way.

Old copy and layout formulas which insisted that every advertisement must have a line about "taking hills on high," and show a drawing of a big pump have been discarded by the majority of the marketing companies. Deep technical discussions about the merits of the product do not appear in this year's crop of gasoline newspaper advertising. Instead, the copywriters of the gasoline advertising have apparently recognized the millions of newspaper readers as average motorists and not a consulting board of lubricating engineers. They have gauged their newspaper copy appeal accordingly.

The result has been that 1930 gasoline newspaper advertising compares very favorably with the newspaper advertising of other products. In going over hundreds of newspapers in making this review, it is apparent the gasoline advertisements in the majority of instances ranked higher in purely advertising technique than the advertisements of many other products.

That they are doing so is a real achievement in itself, for as any seasoned copywriter will tell you, gasoline is not the easiest subject to write about. There are many other products advertised today which offer a better milieu for building an appealing advertising campaign.

One of the new style gasoline campaigns which evoked considerable comment pro and con among those in and outside of the petroleum industry was the "Famous Knockouts of History" series on HI-Test Tydol With Ethyl. Each advertisement in this series featured one of the famous ring battles of history. The drawings were made by Feg Murray whose sport cartoons appear daily in the New York Sun and other papers.

Murray's drawings caught the flavor of the oldtime battles when fighters were more interested in punches than in the gate receipts. Surely, these Tydol ads must have recalled some pleasant memories to the old time fight fans and set the younger ones to thinking, especially those who have seen some of the alleged modern John L.'s in action.

Now, would the readers of these Tydol advertisements stop their ring reveries long enough to give a few minutes' thought to the fact that "HI-Test Tydol with Ethyl was a knockout," was the mooted question which caused many debates as to whether this was really effective gasoline advertising. The objectors maintained that it was stretching the bow a bit to expect readers to do this, and that the comparison between ring knockouts and knockless gasoline was overdrawn. On the other hand, there was many others who were convinced that such a comparison was perfect. These enthusiasts pointed out that the very fact that these Tydol ads were read, and caused comment, proved their effectiveness.

The campaign is still running, and until sales figures are available, the debate will continue. However, as the enthusiasts rightly claim, it's not likely that this Tydol series was passed up by many readers of the daily newspapers. These

Tydol ads had an appeal that commanded attention.

To Colonial-Beacon Oil Co., Boston, must go the credit for one of the most astute gasoline advertising campaigns of the past year. This company's advertising upset the tradition that gasoline copy in order to be seen and read must necessarily be in large space. Colonial-Beacon employed small space—1 column by 4 inches, in a list of newspapers in their territory, but they used it daily in the same papers from March to August.

Furthermore, they did not buy preferred space, which is sold by most newspapers at a premium, but, by constant checking of position with the newspapers on the schedule, they were able to repeatedly secure what was almost preferred space. In every advertisement appeared the well-known Colonial Soldier. Copy was necessarily short but to the point. To the Doubting Thomases who are of the opinion that newspaper copy, to be effectively read, must be in large space, Colonial-Beacon has ample testimony to prove otherwise. Their small copy plan was tested.

Here's what the copy tests proved. Out of 570 questionnaires sent to persons with a Colonial-Beacon advertisement proof enclosed, 492 persons replied they were conscious of having seen this little advertisement in their local newspaper, 448 stated that they were impressed favorably with these ads, while 352 actually admitted this continual small-space advertising had influenced them to patronize Colonial stations and dealers.

Vacuum Oil Co. has been introducing Mobilgas in various eastern territories with an interesting newspaper campaign. It's based on the slant that Mobilgas is a new idea—an idea that's growing, growing, growing, until now it's a regular giant. The artwork is relied upon in the most of the advertisements to get over the sales story effectively.

A good job in hippodroming the announcement of a new popular gas was accomplished by Standard Oil Co. of New York when they brought out the Socony Banner Gasoline. Full pages in heavy type with banners streaming at the top competently told the motorists about merits of the new Banner Gasoline. In all cities of their territories copy was localized, which added to its effectiveness.

Few newspaper readers have been able to miss the simple and distinctive layouts of the Shell Advertisements. You simply can't turn over the pages in which they have appeared without bestowing these Shell advertisements some notice, because their simplicity attracts the eye.

AMERICA
NOUS VOICI
"America—We are Here!" That was the message of the humming Hispano motor as the "Question Mark" gracefully landed on Curtiss field at twilight Tuesday. ☆ Coste and Bellonte did it—the feat which no one had ever before accomplished—a non-stop flight from Paris to New York! Undaunted courage, a thorough knowledge of navigation, unsurpassed skill in airmanship—these—plus an unfaltering motor—were the qualities which brought them through. ☆ It was natural that Coste—noted for his extreme care in preparing for all of his many air ventures—should use Stanavo Aviation Gasoline for this flight as he did in setting the world's distance record (Paris to Manchuria). ☆ This successful flight of the "Question Mark" is but another practical demonstration of the reliance which experts place on "Standard" products. People who know motors and recognize real performance whether it be in an airplane engine or in an automobile rely on "Standard." Every "Standard" product is made according to rigid specifications. There is a "Standard" product for your every automotive need.
STANDARD OIL COMPANY OF NEW JERSEY
ESSO—"STANDARD" GASOLINE—"STANDARD" MOTOR OIL
—STANAVO AVIATION GASOLINE AND ENGINE OIL

Striking full page newspaper advertisement carried by the Standard Oil Co. of New Jersey when Coste and Bellonte made their flight west over the Atlantic

One of the most striking advertisements recently was the full page run by the Standard Oil of New Jersey on the record-breaking flight of Coste and Bellonte over the Atlantic. The headline — "America Nous Voici" told the story at a glance, and the art treatment was splendid. The whole advertisement was a departure and a distinct relief from the usual gas advertisements featuring a new record.

The Standard Oil Co. of New Jersey was also responsible for an unusual series of local testimonial campaigns on Esso. In various cities of their operating territory, the company secured

voluntary testimonials from locally prominent users of Esso. A typical advertisement was one in The Baltimore Sun, which featured a testimonial from Stuart Bolen, the star pitcher of the Baltimore Circles.

"To pull the change of pace that fools the best batter," testified the famous Lefty Bolen, "you've got to have reserve speed up your sleeve for a fast one. I won't use anything but Esso in my car for change of pace in traffic because it's got more of that reserve speed and power than any 'gas' I've ever tried."

A picture of Lefty in action on the diamond was shown along with a photograph of him driving his car. These Esso advertisements looked newsy because of their make-up of pictures of local personages whose names often appeared in the news columns. Readers naturally would recognize the names, and the chances of these Esso advertisements being read were thereby increased.

For one-time stunt shot the Sun Oil Co. deserves the 1930 palm, for a unique Blue Sunoco advertisement. This was a seven columns full advertisement made up in newspaper page style with stories about Blue Sunoco Gasoline. One column was in English and the other six columns in foreign languages. And across the whole page written in pencil was the pertinent sales message. "In Any Language—a Tankful of Blue Sunoco is more Convincing Than a Page Full of Words." Undoubtedly that advertisement prompted not a few newspaper readers to try a tankful.

The American Oil Co., Baltimore, had a good series of large space all type advertisement with straight-from-the-shoulder selling copy on Amoco Gas. No words nor space were wasted in telling why Amoco Gas was the one complete motor fuel.

"This Gasoline Does Its Own Talking" was the potent caption of a particularly good advertisement exploiting Altantic Gasoline. The layout of this ad was reminiscent of the traditional Atlantic Gasoline advertisements—a long panel illustration running practically the entire length of the advertisement with the copy to the right of the illustration. However, this season Atlantic Gasoline ads varied their copy attack and had several different styles of appeals. The series entitled "A Sure Strike" stood out well in the crowded newspaper pages in which they appeared.

The same was true of the two full column advertsements of the Cities Service's Koolmotor Gasoline. Their different shape from the usual run of gasoline advertisement space was sufficient to create that well known eye-compelling effect which every advertiser seeks. In certain markets Pure Oil Co. employed poster advertisements with big type announcements featuring the exact price of Anti-Knock Purol Gasoline. The big, bold type literally shouted at the reader: "Try Anti-Knock Purol Gasoline, and feel the difference."

Richfield uncorked some timely advertisements by tying up their copy with record-breakers in motor car racing and aviation. The Standard Oil of Pennsylvania's "Good Luck" series on Standard Gasoline created a favorable and an effective impression in that company's territory.

The Texaco Ethyl advertisement possessed a substantial selling argument when they asked the motorists point blank "How Much Extra are you getting for 3 cents extra," and then proceeded to tell them what Texaco-Ethyl gives them for their money. The sole criticism to these Texaco Ethyl advertisements were that, in their art treatment, they relied a little too much on a ben day treatment. That is taking a long change on newspaper reproduction for getting the desired effect. However, the metropolitan papers reproduced these Texaco Ethyl advertisements fairly well.

A rather neatly devised layout technique made the Sinclair HC Gasoline advertisements a distinctive series which packed a good selling story. The Conoco Ethyl advertisements secured many friends in the east for that product in their straightforward messages directed to motorists who had never said "Ethyl" to the Conoco salesmen.

Oil Trademarks For Copyright

THE following are trademark applications pertinent to our field pending in the United States Patent office which have been passed for publication and are in line for early registration unless opposition is filed promptly. For further information address National Trade-Mark Company, Barrister Building, Washington, D. C. trademark specialists.

As an additional service feature to its readers, this journal gladly offers to them an advance search free of charge on any mark they may contemplate adopting or registering. You may communicate with the Editor of this Department, or send your inquiry direct to the National Trade-Mark Company, stating that you are a reader of this journal.

"BANNER-PENNA" 100%, representation of a banner. Ser. No. 301,837. Clarkson & Ford Company, New York City. For lubricating oil.

"RACE-O-LENE," representation of wings, etc. Ser. No. 302,925. Atlantic, Pacific & Gulf Oil Company, Kansas City, Mo. For lubricating oils and greases and gasoline.

"PACIFIC." Ser. No. 268,716. Union Oil Company of California, Los Angeles, Calif. For lubricating oils.

"STAROLINE." Ser. No. 303,233. White Star Refining Company, Detroit, Mich. For gasoline, naphtha, lubricating oils and greases, kerosine, fuel oils, and motor oils, and motor fuels, in which a chief constituent is gasoline.

"JESCO," in an oval. Ser. No. 303,443. Jesco Lubricants Co., North Kansas City, Mo. For lubricating oils and greases.

"G-C." Ser. No. 304,240. Georgia-Carolina Oil Company, Macon, Ga. For lubricating oils and greases.

"FYRFIL." Ser. No. 304,451. The Davis Welding & Manufacturing Company. Cincinnati, Ohio. For fill tubes for gasoline tanks.

"STATIONS OF REPUTATION." Ser. No. 268,318. Sobol Bros., Inc., New York City. For gasoline, lubricating oils and greases, spring oils, and flushing oils.

"COLONIAL." Ser. No. 299,894. Borne, Scrymser Company, New York City. For lubricating oils and lubricating greases.

"VISKY." Ser. No. 302,978. Viscosity Oil Company, St. Joseph, Mo. For lubricating oils and greases.

"QUAKER SEAL." Ser. No. 303,440. Hanford's Inc., doing business as The Quaker Seal Petroleum Co., Sioux City, Iowa. For lubricating oils and greases.

"FELCO." Ser. No. 303,845. Farmers Elevator Service Company, also doing business as Farmers Elevator Co., Ralston, Iowa. For gasoline, kerosine, and lubricating oils.

"DERBY'S FLEXGAS," star within a circle, D O CO., etc., in red and blue. Ser. No. 305,161. The Derby Oil Company, Wichita, Kansas. For motor-fuel oils and gasoline.

Representation of an oil can in green and white. Ser. No. 297,779. Quaker State Oil Refining Co., Oil City, Pa. For lubricating oils.

ADVERTISING PAGES REMOVED

Institute Affords Medium for Study Of Marketers' Common Problems

By Paul E. Hadlick*

OIL men are prone to regard the American Petroleum Institute's Division of Marketing solely as the agency for promoting the work of the national code of practices for marketing refined petroleum products. That view is correct insofar as it goes, but it doesn't go far enough.

Code work is only one of the division's many present and potential jobs. For while it is called the division of marketing, actually it is a multiplication of opportunities for service to the marketing branch of the petroleum industry. Not all of them, perhaps far too few of them, have been seen or grasped as yet, chiefly because, I believe, the division is so new that the full scope of its possibilities cannot be appreciated.

But there is every reason to believe that it can do for the marketing branch what the older division of production has done for the producing branch, and in a specialized way what the institute has done for the industry as a whole. In fact, the scheme of its organization makes possible a specialized service never before available.

The division's work with the code is known so widely that little concerning it need be said here. However, I might point out that the fact we have a marketing code alone is sufficient refutation of those who said it never could be done. The fact it is working, not 100 per cent perhaps, but nevertheless working, clinches the argument.

The code's future naturally rests with the individual marketer. No division, new or old, can guarantee a future. But the thought of the names of 16,000 signers attached to that code ought to convince the skeptical that a fair proportion of the marketers of this country are game to try an experiment in better business practices that promises much instead of struggling to keep going on admittedly poor practices that promised nothing.

This code, like this division, is comparatively new. There have been short comings, discrepancies, and seeming failures in some instances there have been a few withdrawals, but so few that their very rarity tends to give them undue and undeserved prominence.

Paul E. Hadlick

who was made secretary of the marketing division of the A.P.I. when it was created a year ago. Although the code has taken much of the time of the marketing division. Mr. Hadlick points out in the following article the many services available to this end of the industry in solving its common problems

I am convinced that most, if not all, the difficulties have been due largely to misunderstandings. These, time and wider knowledge of the code will correct.

In fact, the code itself already has become a marvelously efficient agency for correcting misunderstandings, dispelling false rumors and convincing marketers of each other's fundamental sincerity. It was not intended to be, and certainly has not proved to be, a panacea for marketing ills, but the code has served to focus attention on mutual troubles and given marketers a common cause, which alone should make it fully worth while.

So much for the code except to say that as the organization of national, regional and state code committees achieves solidarity and becomes a self-sustaining, efficient unit, much of the code work now being done by the division as a guiding agency will be transferred.

It is provided in the division plan of organization that the division of marketing shall be assigned the institute's activity with regard to the code, except that the national committee on interpretation of the code shall continue to function as a standing committee of the institute's board of directors. But it is realized that the code is the code of the industry and that with the industry itself lies the responsibility for it.

I have indicated that the division has other interests and other jobs, at hand or contemplated, and they are plentiful. Its standing committee on automotive transportation has taken over the work of the former general committee, with activity limited to the marketing field.

Similarly, the division's standing committee on railroad transportation has grown out of a former general committee. The work handled by both committees is of vital importance to the marketer as affecting an overhead cost that must be controlled. For that reason anything that may be done to increase efficiency and reduce ex-

*Secretary, American Petroleum Institute, Division of marketing.

penses reacts favorably upon the marketing branch.

Three other divisional standing committees have been formed. These are the committee on safety, committee on fire prevention, and committee on disposal of marketing wastes. They are linked with similar committees of the division of production and division of refining and their work is coordinated through a mutual secretary.

THE committee on safety, authorized to handle activities relating to safety of life and limb in marketing and to cooperate with safety agencies, now is engaged in a study of means and methods of promoting safety, both for the workers of the petroleum industry and its patrons.

The importance of this work may be appreciated if one considers the risks that attend the handling of heavy, bulky, slippery lubricants, flammable liquids and equipment of all sorts. No marketer consciously would face the hazard of letting harm befall an employe or a customer, yet there are many marketing practices which create just such risks. These, it is believed, can be eliminated by intelligent study and purposeful precaution.

The work of this committee, looking to the prevention of injury to human beings and of damage to property and equipment, must be regarded as a worthwhile, well-directed effort to save time and toil, trouble and expense. Moreover, it should in a large way be decidedly fruitful of good will.

The committee on fire prevention is working with similar committees of the other divisions on comprehensive manuals designed to cover every source of fire danger and to suggest approved methods of preventing and fighting fires.

This is no idle effort for an industry which deals so largely in highly flammable liquids and gases. Especially should it be helpful to the marketing branch, for the fire hazard here is increased because of the close contact with an unintentionally careless public.

The fact one court has held the customer to be responsible should a filling station burn because of his negligence cannot be construed either as an impregnable defense or an excuse for letting down the bars of precaution.

The rapid growth in the number of filling stations, their location in crowded business and residential sections and the seemingly unavoidable leakage from vehicles of flammable gases and liquids attending their operation make the adoption of efficient fire prevention and protection methods imperative. Anything we can do along this line also should be productive of good will.

The committee on disposal of marketing wastes is tackling problems that long have troubled the marketer. It is believed the committee will accomplish much if it solves only the problem of satisfactory disposal of crankcase drainings, and it is not unreasonable to hope that this committee's work will reveal a paying outlet for this waste, especially since in some areas there has developed a demand for such oil for use as a fuel and in combating insect pests.

The division has also a committee on program, which recommends the program dealing with marketing for the annual and mid-year meetings.

The organization of the division of marketing is such that any problem presented by the industry can be handled by groups of interested oil men working in coordination throughout the industry and the country. As a matter of fact the future activities of the division are more a matter of what to do than of how to do it.

WE HAVE learned, from Institute experience with committees and other cooperative groups, that we can accomplish results, but what we shall attempt to do and what we may accomplish rests with the industry. It is a fundamental principle of institute policy that the industry knows best what it desires the institute to do.

This policy was voiced first by the late Robert L. Welch, first general secretary and counsel. Making his report at the organization's first annual meeting at Washington, in 1920, Mr. Welch outlined the institute's principles, saying:

"The most important of these principles is the fundamental one that the institute should never attempt to do anything for the industry which individual companies in the industry can do for themselves. In following this principle, therefore, the officers of the institute in general have waited for the industry to request activity rather than to seek it. It has been assumed that the industry knows best what it desired the institute to do rather than that the institute knew best what the industry ought to do."

The passing years have established the soundness of that policy and the passing months have brought suggestions from the marketing branch of the industry as to matters with which the division of marketing well might be concerned.

FOR instance, the suggestion has been made that the marketing division create a committee on standardization, similar to those already at work in the other divisions. Such a committee might work on simplification and standardization of the containers, equipment, products, methods, etc., used in marketing.

It appears there is a field here for a study, among others, of the best means of measuring and labelling products, of handling them and of dispensing them, for today the variety of practices is almost as great as the number of firms in business.

Suggestion has been made for the formation of a committee on taxation, a subject of growing interest and one that bids fair to be of vital importance to marketers should the policy of taxing retail outlets, proposed already in several cities, be adopted generally.

It has long been felt there is a real need for a comprehensive study of ever-growing property taxes. The same is true of sales taxes, notably the increasing levy on gasoline, which puts the marketer in the position of public tax collector, frequently without remuneration, but always with liability.

Another suggestion contemplates a committee on new uses for petroleum products. New uses might well engage the attention of the marketer, not only because of the possibility of

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expanding his business, but because their development on any substantial scale would go far to free the entire industry from the curse of overproduction and demoralized markets.

The fact that preliminary research in government laboratories has disclosed the possibility of obtaining from petroleum sources substitutes for butter and leather, cloth and sugar, rubber and perfumes, as well as other products, indicates how important a development along this line might be expected.

The petroleum industry, from its inception, has been affected by sudden and widespread changes in the demand for its products caused by circumstances beyond its control. Here might be an opportunity for the industry to direct subsequent changes.

And then there is the matter of economics, study of which the marketing branch has been accused of overlooking and which certainly has seemed to overlook the marketing branch. The industry has made every effort to achieve economies in production and refining, to base these activities on sound economic principles, with results that have been profitable.

These economies, however, may have been achieved at the expense of the marketing end of the business. In other words, by passing the buck, we may have lost in marketing all that we saved in production and refining.

Frequently it has been said, for this reason and others quite as obvious, that marketers ought to know more about their own business. The business world in general is striving to learn more about marketing, having traded the mass production mania for a keen interest in distribution.

Here then is another fertile field for economic surveys and sound study, either by the division or outside agencies. We must admit that at present we have no accurate figures as to the number of marketing outlets in operation, as to how many are being built or how many are closing and why. We do not even know the exact number of gasoline pumps serving the public.

Perhaps it is not too much to hope that at some time in the near future our marketing division can begin the regular collection and dissemination of marketing statistics. A systematic check on the number of market outlets, figures showing consumption of fuel and lubricants by any and all agencies, correct statistics on the sale of motor boats, cars and trucks, planes, tractors, stationary engines and other possible sources of demand certainly should be helpful to any marketer.

Knowledge of business trends is a modern business necessity. Why should the marketer be blind?

I have said the attention of the business world is being focused on the problems of distribution. The petroleum industry has had the foresight to establish the institute, its national trade association. The producer and the refiner have learned to make good use of the service it can and does render. The division of marketing is available for the benefit of the marketer.

Oak Plank Allows Lift To Serve Bantam Car

CLEVELAND

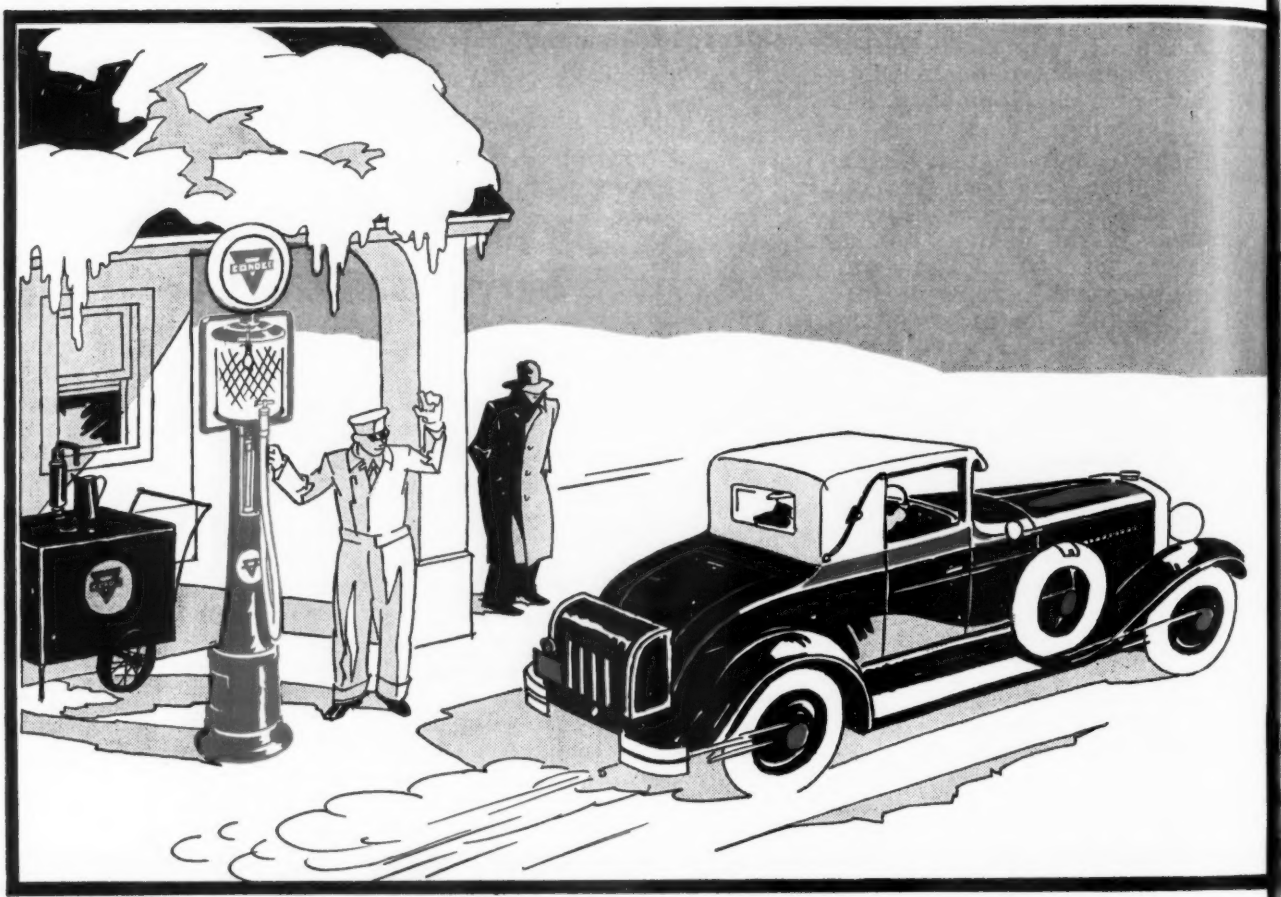
WITH the increased sale of the American Austin car some attention is being given by oil companies to facilities to service these vehicles. Their tread is only 40 inches which width is 17 to 18 inches narrower than the standard car tread.

Cities Service Oil Co. in Cleveland has anticipated the more extensive use of these small cars by providing a special, third drive rail on one of the six lifts at its new super station at 82nd street and Carnegie avenue, Cleveland.

The third drive rail is a 2 x 12 oak plant 14 feet long. It is placed inside the regular rail of one side of the lift. The cross supports of the lift support the center of the third rail. The ends are supported by four hand-forged brackets which are hooked from the inside flange of the drive rail along which the third rail rests. The plank is bolted to the bracket. An iron strip screwed to the inner side of the third rail, provides a flange to keep the wheels of the car in the channel.

The centers of the third and other rail on which the car's wheels rest are 40 inches apart. The inner edges of the two rails are 28 inches apart.

WINTER EMPHASIZES
OF THIS FASTEST



CONOCO GERM PROCESSED
PARAFFIN BASE MOTOR OIL

CONOCO

ANOTHER BIG SALES POINT
SELLING MOTOR OIL

▼

The Easier Starting Ability of this Oil is Due to De-waxing . . . *and Penetrative Lubricity!*

ere are some facts which will interest your customers. Engineers agree at 40% to 60% of all motor wear occurs during the starting period. In inter months starting is slower, and even more wearing on motors.

With its two big advantages for preventing winter starting wear, ONOCO Germ-Processed Motor Oil is easily maintaining its position as e fastest selling oil. These two advantages, namely: Penetrative Lubricity nd De-waxing, are being featured in CONOCO'S general advertising.

Thus thousands of motorists are being turned into stations selling this il. If you are interested in keeping winter oil gallonage up to a higher oint this year, write the division office nearest you. Germ-Processed oil ill get you more than your share of the oil business in your locality.

CONTINENTAL OIL COMPANY

Albuquerque, New Mexico
Butte, Montana
Denver, Colorado
Great Falls, Montana
Kansas City, Missouri
Lincoln, Nebraska
Richmond, Virginia
New York, N. Y.
Ponca City, Oklahoma
Salt Lake City, Utah
Wichita Falls, Texas
(CONOCO OIL CO.) Chicago, Illinois

Over 700 Jobbers *Say "Yes" To This!*

DOES it pay to market your own brand of motor oil, providing you can get a super-quality — one made from 100% Pennsylvania crude—at a price that makes substantial profits certain?

More than 700 oil jobbers who buy from this 50 year old refinery organization would answer "Yes." *And they ought to know.*

We'll make up any grade of "Pennsylvania" motor oil (Sharples Process) to your own specifications. Or if you prefer, we'll recommend one of our own tried and tested specifications that will exactly suit your needs.

Whether your order calls for tank cars, compartment tank cars, barrels or drums, you are assured of prompt and efficient service. Your request for details and quotations will receive immediate attention.

Guaranteed 100% PURE PENNSYLVANIA OIL

Permit No. 31

THE FREEDOM OIL WORKS CO.

FREEDOM, PA.

Refineries at FREEDOM and CORAOPOLIS, PA.

Also available for immediate shipment

85/90 Viscosity Bright Stock
100% Pennsylvania Neutrals
600 Steam Refined
650 Steam Refined
600 Flash Steam Refined
Freedom Filtered Kerosene Oil

FREEDOM

100% PENNSYLVANIA OILS

FO-503

New Stations Building

Note: Material used in this column is taken principally from newspapers. NATIONAL PETROLEUM NEWS assumes no responsibility for its accuracy. Headquarters of companies and addresses of individuals are given wherever possible.

The list as published from week to week cannot be looked upon as indicative of the relative extent to which stations are being built in various parts of the country.

Service Stations

Oskaloosa, Ia.—A. Weatherwax.
Ann Arbor, Mich.—White Star Refining Co., 903 W. Grand Blvd., Detroit.
Brookfield, Ill.—Mrs. Feely.
Cleveland, O.—Standard Oil Co., Midland Bank Bldg.
Cleveland, O.—The Texas Co., Chrysler Bldg., New York City.
Princeton, Ind.—B. O. Wilson.
Springfield, O.—The H. G. Root Co.
Rochester, Ind.—Sinclair Refining Co., Conway Bldg., Chicago.
Baltimore, Md.—Standard Oil Co. of New Jersey, 26 Broadway, New York City.
Lowell, Mass.—Standard Oil Co. of New York, 26 Broadway, New York City.
Torrington, Conn.—James F. McDermott.
New Bedford, Mass.—Sun Oil Co., 1428 S. Penn Sq., Philadelphia.
Charlotte, N. C.—Standard Oil Co. of New Jersey, 26 Broadway, New York City.
Geneseo, N. Y.—Standard Oil Co. of New York, 26 Broadway, New York
Manchester, Ia.—The American Oil Co., Dubuque.
City.
Grand Forks, N. D.—Cities Service Oil Co., Commercial Bldg., Tulsa.
Cavour, S. D.—American Gas & Oil Co.
Halletsville, Tex.—Humble Oil & Refining Co., Houston.
Holdenville, Okla.—Independent Oil & Gas Co., Philtower Bldg., Tulsa.
Corpus Christi, Tex.—J. W. Horton.
San Antonio, Tex.—B. Sandfield.
Albia, Ia.—Continental Oil Co., Ponca City, Okla.
Des Moines, Ia.—Cities Service Oil Co., Commercial Bldg., Tulsa.
Red Wing, Minn.—Badger Oil Co.
Lake City, Minn.—Cities Service Oil Co., Commercial Bldg., Tulsa.
Cheboygan, Mich.—Russell Jewell.
Louisville, Ky.—Standard Oil Co. of Kentucky, Louisville.
Scotts, Mich.—Lynn C. Lorbeck.
St. Elmo, Ill.—Shell Petroleum Corp., Shell Bldg., St. Louis.
Elizabethtown, Ky.—Standard Oil Co. of Kentucky, Louisville.
Birmingham, Mich.—F. E. Sternal.
Bloomington, Ind.—Sinclair Refining Co., Conway Bldg., Chicago.
Yankton, S. D.—William McElwain.
Bartlesville, Okla.—National Refining Co., National Bldg., Cleveland.
Burlington, Ia. — Shell Petroleum Corp., Shell Bldg., St. Louis.
Faribault, Minn.—Shell Oil Co., 200 Bush St., San Francisco.
Hillsboro, Ia. — Shell Oil Co., 200 Bush St., San Francisco.
Lacona, Ia.—Lacona Oil Co.
Oxford Junction, Ia.—Louis Kula.
Hillsboro, Ia.—Standard Oil Co. of Indiana, 910 S. Michigan Ave., Chicago.
Staples, Minn.—M. J. Merickle and C. W. Orr, Wadena.

Winona, Minn. — Shell Petroleum Corp., Shell Bldg., St. Louis.
Correll, Minn.—L. F. Wods.
Farmington, Minn. — Northland Oil Co., 470 N. Cleveland Ave., St. Paul.
Stevens Point, Wis.—A. E. Flugaur.
Bellaire, O. — Sinclair Refining Co., 45 Nassau St., New York City.
Marion, O.—R. DeProsse, 168 Holmes Ave.
Marion, O.—G. C. Newhorter.
Hamilton, O.—Arthur & Carl Frechtling.
Kansas City, Mo.—Phillips Petroleum Co., Phillips Bldg., Bartlesville.
La Crosse, Wis.—A. O. Colby, 520 King St.
La Crosse, Wis.—Arthur Cheney.
Goodell, Ia.—Champlin Refining Co., 202 S. Monroe St., Mason City.
Muscatine, Ia.—Continental Oil Co., Ponca City, Okla.
Northwood, Ia.—Champlin Refining Co., 202 Monroe St., Mason City.
St. Paul, Minn.—Shell Petroleum Corp., 312 Baker Bldg., Minneapolis.
Greensboro, N. C.—Dr. J. Boyles.
Worcester, Mass.—Walter S. Doane.
Bradentown, Fla.—Seaboard Oil Co., 1730 Lynch Bldg., Jacksonville.
Americus, Ga. — Shell Petroleum Corp., Shell Bldg., St. Louis.
Williston, L. I.—Mary S. Collins, Hillside Ave.
Williston, L. I.—William A. Eaton.
Plattsmouth, Neb.—Continental Oil Co., Ponca City, Okla.
Cleveland, O.—J. C. Smith.
Saunemin, Ill.—Elmer Butz.
Billings, Mont.—Brown Oil Co.
Marion, O.—Anna Ryan.
Minneapolis, Minn.—C. W. Victorson, 4037 13th Ave., S.
Ute, Ia.—Ed W. Spahn.
St. Paul, Minn.—Phillips Petroleum Co., Phillips Bldg., Bartlesville.
Willmar, Minn.—Shell Petroleum Corp., Shell Bldg., St. Louis.
Lisbon, O.—W. D. Morris.
Odebolt, Ia.—Skelly Oil Co., Skelly Bldg., Tulsa.
Mayville, N. D.—Cities Service Oil Co., Commercial Bldg., Tulsa.
Dell Rapids, S. D.—Fay Farrell.
Spooner, Wis.—W. A. Porter & Son.
Iroquois, S. D. — Shell Petroleum Corp., Shell Bldg., St. Louis.
San Antonio, Tex.—Magnolia Petroleum Co., Dallas.
Bedford, O.—Sun Oil Co., 1428 S. Penn Sq., Philadelphia.
Shelby, O.—Shell Petroleum Corp., Shell Bldg., St. Louis.
Harlan, Ia.—A. J. Marsh and R. C. McLaughlin, Portsmouth, Ia.
Brainerd, Minn.—Martin E. Dullum.
Northfield, Minn.—Skelly Oil Co., Skelly Bldg., Tulsa.
Owatonna, Minn.—Elliot Oil Co.
Waterloo, Ia. — Lester Miller, 408 Pioneer Bldg.
Waterloo, Ia.—F. Hershberger, 1416 W. 4th.
Waterloo, Ia.—C. W. Campbell, 403 Washington.
Cedar Falls, Ia.—Independent Oil & Gas Co., Philtower Bldg., Tulsa.
Davenport, Ia.—Albert P. Wolters, 1326 W. 12th.
St. Paul, Minn.—Standard Oil Co. of Indiana, 910 S. Mich. Ave., Chicago.
Muncie, Ind.—Eastern Indiana Oil & Supply Co., Geneva.
Greenville, Ky.—Gulf Refining Co., Frick Bldg. Annex, Pittsburgh.
Davenport, Ia.—Continental Oil Co., Ponca City, Okla.
Clarksville, Mich.—Lewis Cool.
Owen, Wis.—Arthur Bosma.
Casey, Ill.—W. C. Turner and C. F. Beavers.
Philadelphia, Pa.—Avon Garage Co.
Columbus, O.—Miller-Riley Oil Co.
Washington, Ind. — Mid-Continent Petroleum Corp., Cosden Bldg., Tulsa.
Peoria, Ill.—Bryant & Lewis Oil Co.
Canton, O.—Mallernee Oil Co., Dover.

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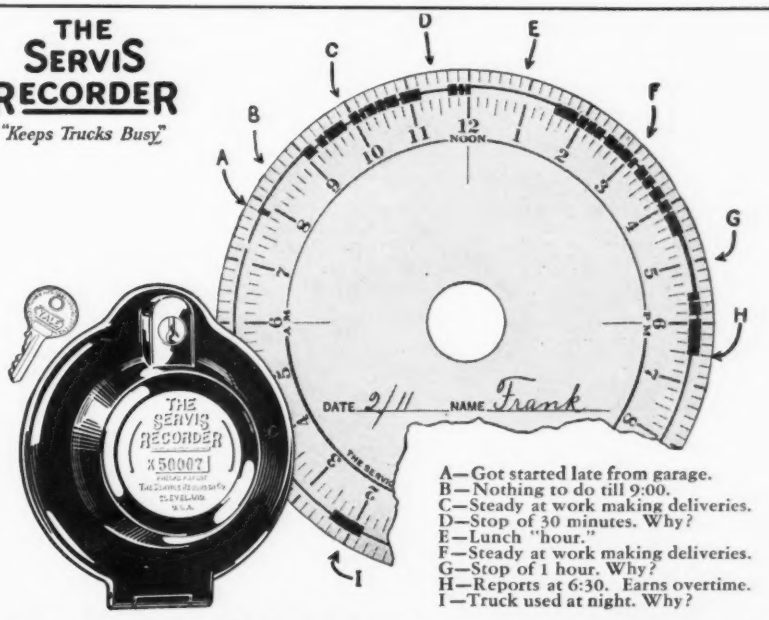
THE SERVIS RECORDER
"Keeps Trucks Busy"



A—Got started late from garage.
B—Nothing to do till 9:00.
C—Steady at work making deliveries.
D—Stop of 30 minutes. Why?
E—Lunch "hour."
F—Steady at work making deliveries.
G—Stop of 1 hour. Why?
H—Reports at 6:30. Earns overtime.
I—Truck used at night. Why?

The REAL DIARY of a TANK TRUCK

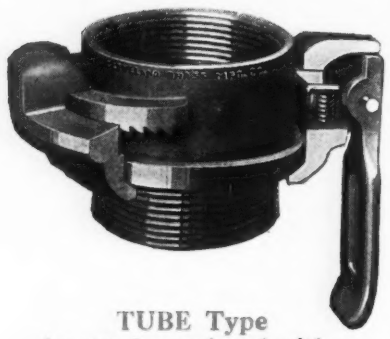
No wonder it has been called "the most interesting chart in business." ¶ For the first time you are enabled to see your own truck "face to face." ¶ It's a revelation!

And you notice at once that your driver is only a part of your problem. ¶ Now you see your whole problem laid out before you — analyzed for you in terms of hours and minutes.

Write for Booklet X
THE SERVICE RECORDER COMPANY
Cleveland, Ohio, U. S. A.

SAVE
truck time
with

LeverLocked
HOSE COUPLERS



TUBE Type

for trucks equipped with a hose tube in the tank. Handle lifts up for connection and disconnection and folds down (as above) when put into tube. Notice the ratchet grip construction.

Change To BARRETTS

Barrett LeverLocked Hose Couplers are easy to install. The female faucet nipple screws permanently onto the tank faucet, the hose nipple and clamping ring screw into the female hose nipple. Both the Tube Type and Regular Type (below) are made in three sizes—1½", 2" and 3".

REGULAR Type

for trucks with hose rack instead of tube. The thumb trigger on the left releases the grip when coupling is to be disconnected.

Barrett LeverLocked Hose Couplings save ten to twenty minutes on each delivery. They make absolutely leak-proof connections which save dollars and decrease danger of fire. They are quick and easy to operate. An eighth turn joins the hose securely to the faucet. A twist in the other direction breaks the connection. No wrench is needed.

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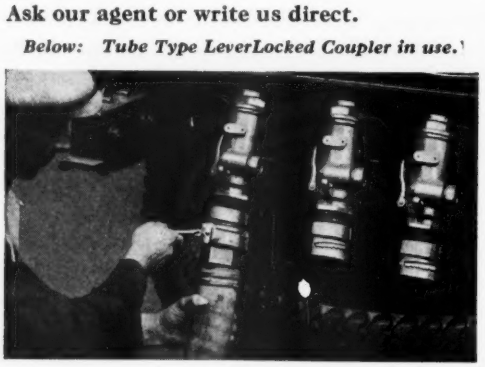
Thousands of tank trucks now use Barrett LeverLocked Hose Couplers; thousands of operators won't waste time with any other kind.

Ask our agent or write us direct.

Below: Tube Type LeverLocked Coupler in use.



The red tube to the left represents the tank truck hose tube. Contact with the tube will not damage the coupler because there are no outside threads.

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Lever Locked **BARRETT** *Hose Couplers*

THE CLEVELAND BRASS MANUFACTURING COMPANY, 4606 Hamilton Ave., CLEVELAND, OHIO

Tank Trucks of Yesterday, Today and Tomorrow

By J. W. Sinclair*

A FAR cry from the petroleum tank truck of yesterday to the tank truck of today? By no means. You do not have to be an octogenerian to indulge in "I remember whens" relating to automotive transportation. Comparative striplings in the transportation game will readily recognize the obsolete type of petroleum tank truck pictured in Fig. 1, as quite a few of them continue in operation today.

They are generally relegated to the background, to be sure, and merely carrying on until the march of progress obliterates them completely. The fact that they continue to roll is a tribute not only to their soundness of construction; but is also evidence of the rapid advances made in design not only in the truck chassis, but in the auxiliary equipment installed thereon by the operator.

The contrast in types between Figs. 1 and 3 is all the more startling when it is realized that the brief period of only 13 years separate them. Will the six-wheel vehicle pictured in Fig. 3 be as obsolete 15 years hence as is the two-cylinder-under-the-seat motor type today? Your guess is as good as the next. But it is a safe bet that it will be.

The driver's compartment is in itself a criterion of progress. Not so many years prior to the earliest type pictured, trucks were generally sans windshield, sans overhead covering, and in fact sans everything except a place whereon to sit, and possibly a semblance of a lazy-back. In those days the driver considered himself thrice blessed in his good fortune in exchanging reins for steering wheel, and worried not about a bit of wind in the face or rain on the head.

Presumably however, as he grew satiated in his new luxury and the initial thrills wore off, the rain drops trickled down his nose became just a bit irritating, for it rains at times, even in California. And his cries of distress brought relief in the balloon-like top-covering pictured in Fig. 1.

He was pacified for the time being, but not for long.

It does no good to cover the head if the wind is blowing, for water under such conditions moves in the horizontal plane as well as the vertical. It also grows a bit cold at times, even in California. The later type cab and windshield assembly pictured in Fig. 2 acted as pacifier number two. And presumably having been innoculated with the germ of good-will towards men, the operator comes forth voluntarily with the all-enclosed, de-luxe type of cab on the modern six-wheel unit shown in Fig. 3.

The evolution of the driver's compartment was not brought about by humanitarian motives alone. Driver-comfort is conducive to lessened fatigue. Fatigue is a parent of accidents, and accidents cost money. Also, granting soundness of construction, the increased initial cost of the enclosed cab is offset throughout its life by decreased maintenance cost as compared with the open-type curtained cab. A review of curtain replacement expense from year to year is indicative of one of the economies thus effected.

As the lines of the cab have become more pleasing through the years, so it is with tank design. The general appearance of the truck pictured in Fig. 1 gives a fleeting impression of the Hunch-back of Notre Dame. Height is not proportionate to wheel-base; and as for seat riser elevation, one vaguely wonders whether the altitude would not

*Supervisor of automotive equipment, Union Oil Co. of California and President Southern California Automotive Council.

Fig. 1—The tank truck of yesterday (1917)

be conducive to driver nose bleed.

The advent of the elliptical tank not only permitted streamlining of the unit as a whole, but materially lowered the center of gravity of the load. Tank construction has kept apace with improved appearance. The riveted tank has been replaced with the all-welded unit; and the single-wrapper shell is also being increasingly used. The latter type eliminates unsightly compartment tie-rods.

Difficulty was initially experienced with the single-wrapper type of construction, due to its lack of flexibility as compared with the multiple-wrapper shell type; but improved construction and suspension methods, together with improved road conditions, greater flexibility in the truck frame, and the advent of low-pressure tires, has so reduced torsional strains on the tank-shell as to offset objections.

As the general design of the truck has improved, so has the finish. As clothes make the man, a pleasing and harmonious paint job places the modern truck in the Beau-Brummel class. Simplicity is most effective, and lettering is held to the minimum. Consider the lettering on the truck in Fig. 1. About the only bit of information lacking seems to be the name and address of the board of directors.

The value of lettering on any motive unit depends upon the extent of its absorption by the casual spectator as the vehicle moves along the street. A single word, if it carries a meaning or definitely identifies the unit with the company-owner in the mind of John Public, is of far more value than ten, five or even two words if those words are not readily imprinted upon the mind of the observer. As a contrast with the lettering on the truck in Fig. 1, note the single word appearing on the six wheel unit in Fig. 3.

To point out, even briefly, the advancements made in chassis and motor design would be beyond the scope of this short commentary on vehicles "as was" and "as is." Increased power calls for increased braking efficiency, as well as adequate drive systems to transmit such power to the outer periphery of the driving wheels. Radiation, carburetion, lubrication, electrical systems, and motor fuels all must conform to the newer and higher standards.

The tire manufacturer has by no means lagged behind. From solids, to cushion, to high pressure, and then on to low-pressure pneumatics represents his contribution to the truck of today. And tire mileage is increasing yearly.

As the tank is one of the major considerations to the petroleum marketer, it being the one unit peculiar to his calling, a few additional remarks thereon might be appropriate. We have already mentioned that portion of the tank visible to the man on the street, namely the general contour of same, and its harmonious adaption to the general lines of the vehicle. But what the casual observer does not observe are those safety devices which permit the transporting of highly inflammable commodities through city streets with minimum hazard.

Internal valves which prevent loss of commodity even though in accident the truck flow lines are sheared clear of the tank proper. Valves which automatically close when the temperature exceeds a certain intensity. Valves which cannot be opened while the motor of the vehicle is running. Valves which are as nearly foolproof as is humanly possible. Tank compartments equipped with breather valves and fusible elements to relieve pressure in case of fire. Static eliminators so arranged that the fill cap cannot be removed unless the static wire is first attached.

In deliveries from the tank to the customer, standards of speed and accuracy make increasingly stringent demands. The elliptical tank, being of a lesser vertical diameter than the round tank of equivalent capacity, has the disadvantage of a lower average liquid head, and accordingly adversely influences the rate of flow. To offset this condition, more attention is being given to reduction of angularity of flow lines, and thus minimizing resistance to flow. The 45 degree angle turn in a flow line is passed through the use of light welded tubing, shaped to the greatest radius possible at turns within the space available, reducing frictional resistance. Larger diameter flow lines are also made possible by reason of the decreased weight of the welded tubing as compared to iron pipe. In this usage aluminum alloys are coming to the fore, and give promise of still further relief insofar as weight is concerned.

The use of meters on tank trunks is as yet in its comparative infancy insofar as general usage is concerned. Although possessing undeniable advantages from a stock-accounting standpoint, such advantages are in a large measure offset by the flow resistance set up by their usage. It is safe to

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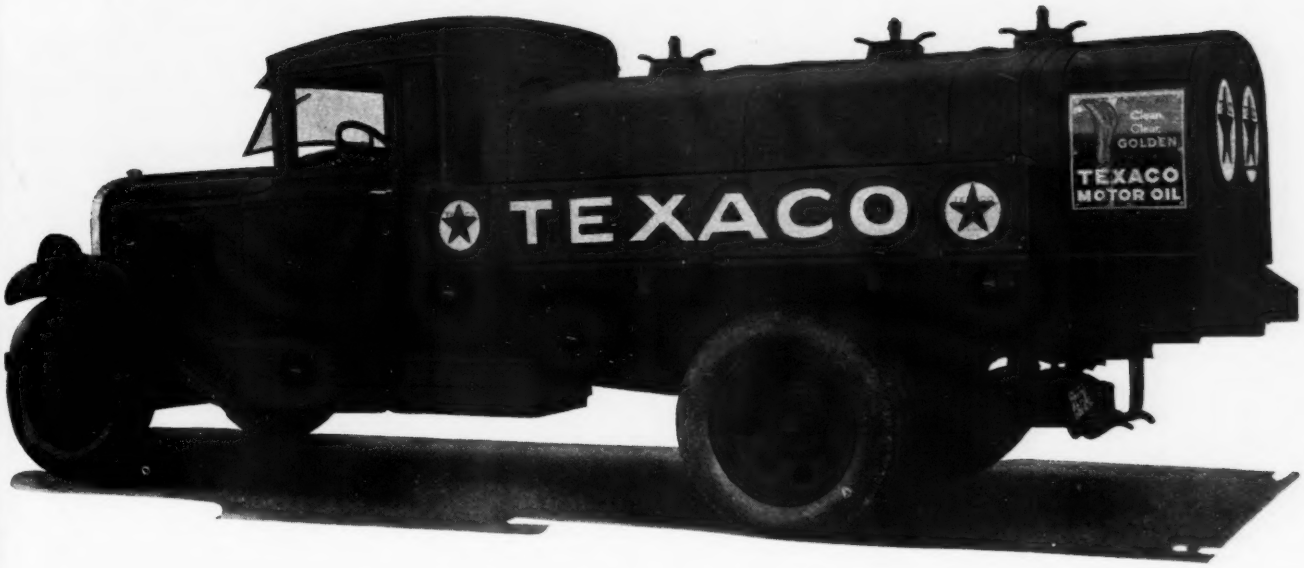
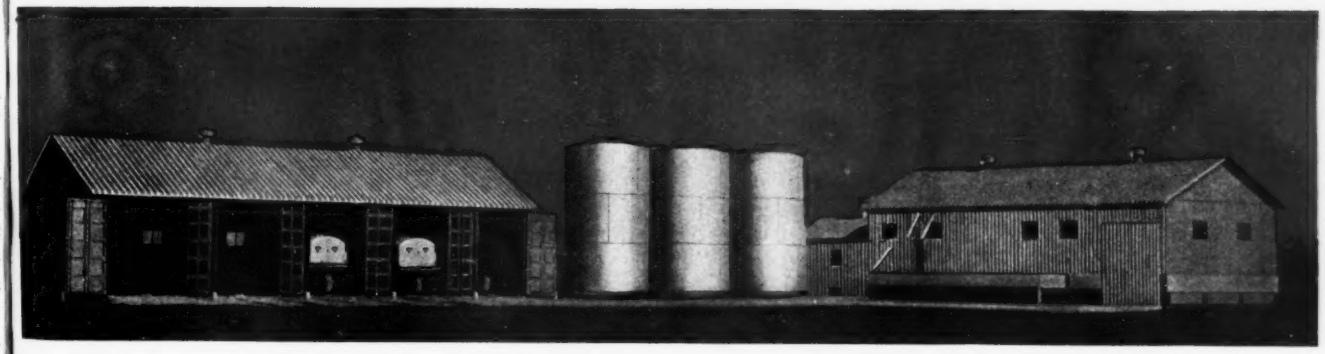
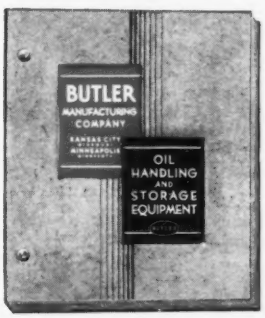


..TRUCK AND TRAILER TANKS



Butler truck tanks, trailer and semi-trailer tanks, super service fuel oil delivery units and combination truck tank and stake body units for mixed bulk and package loads, as well as buckets, funnels, carrying cans, drums and delivery hose—accessories needed in connection with delivery units. On these too, the economies of concentrated buying are to be gained.



More than 3,000 officials have requested the new Butler Loose-Leaf Book which gives valuable buying information on practically every item of equipment needed in the transportation, storage, handling and dispensing of petroleum products. One will be sent to you on request.

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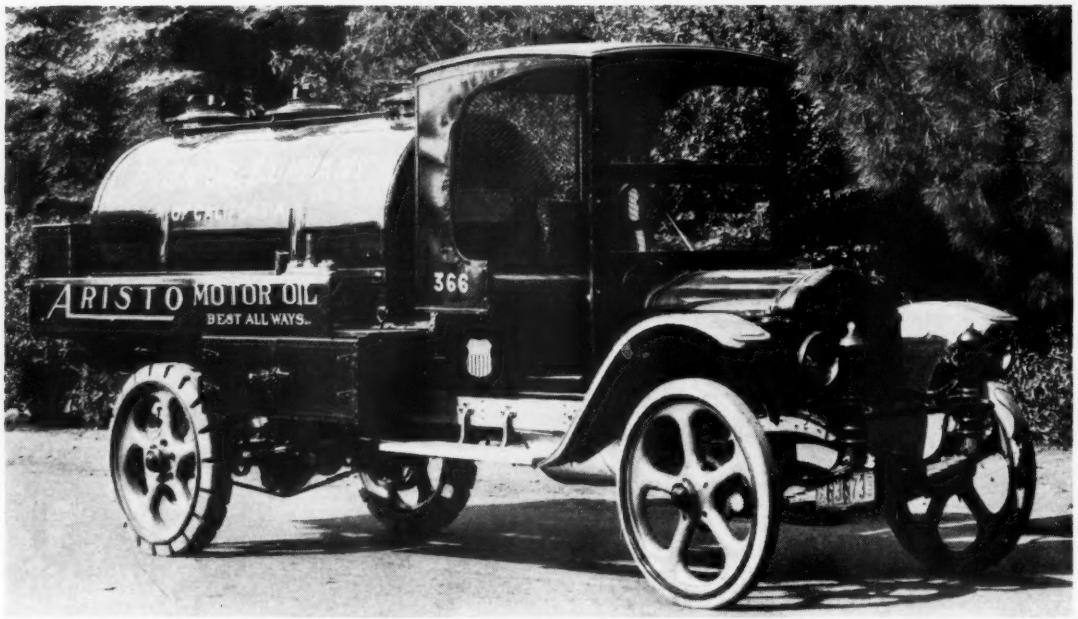

Fig. 2—The tank truck of yesterday (1922)

predict that not until the meter manufacturer so perfects his product as to give greater flow will their adoption become general.

The metered truck, even under its present handicap, has proven very helpful in overcoming certain marketing conditions brought about by the reluctance in some areas to accepting split-compartment deliveries. When such a condition is encountered, back-haul becomes pronounced, the gallons delivered per mile of truck travel suffer a material reduction, with the attendant increase in cost per gallon delivered. Metered deliveries offer the solution, as the lessened flow rate is offset by the elimination of back-haul.

Thus far all remarks seem to be merely paean of progress—a figurative patting on the back all concerned as to accomplishments resulting from past efforts and experiences. Having done quite a bit of "pointing with pride," we must indulge in a bit of "viewing with alarm." There is no gainsaying the fact that much yet remains to be done in the interest of petroleum trucking.

The present day tank truck is altogether too heavy in proportion to the pay load carried, and the major portion of this excess weight rests in the tank shell. Major relief through the use of aluminum alloys is already an immediate prospect, if not an assured fact. A discussion of the aluminum tank is material for an article in itself if it be done justice, and accordingly it is merely mentioned. However, the aluminum tank will not be universally adaptable until workmen capable of welding this material are as readily available as are welders of steel today. This for the reason that no matter how sound the initial construction, repairs at a later date are inevitable, whether occasioned by accident or otherwise; and if it becomes necessary to transport such tanks to larger centers for repairs the cost of so doing will be prohibitive, not to mention the loss due to vehicle tie-up.

With the tank truck fleet operator, interchangeability of tank units on various chasses is an important factor, but efforts in this direction are frequenly nullified by the absence of approximate uniformity of wheelbases and loading spaces of trucks of different manufacture, but of the same rated carrying capacity. This frequently re-

Fig. 3—The tank truck of today (1930)

sults in a tank being built to suit the chassis, rather than an adherence to a standard which might otherwise be adopted, based upon the capacity of the tank. It is gratifying to note that some of the larger truck manufacturers are now striving to bring about approximate uniformity in this respect.

Notwithstanding the tremendous strides made by truck tire manufacturers in the perfection of their product, the truck operator is frequently handicapped by the lack of uniformity of overall dimensions of tires of the same size, but of different makes. This condition is especially acute in the duel installations on rear wheels.

Any discussion of the desirability of uniformity would be incomplete without reference to the tank, and in this respect tank truck operators have themselves to blame for the existing lack of standardization. Fundamentally the requirements of truck tank users differ in no pronounced degree. Such differences as may exist are reduced in proportion to the limits of the geographical area considered.

Within any restricted area today, even with the later type of truck tanks, one may see tanks of widely varying capacities, types and design. A similar variety of mountings, can racks and bucket boxes and flow lines are also in service. Although it is true that local restrictions or marketing peculiarities are responsible in some measure for these differences, there is ample opportunity for basic uniformity at least in tank shells and capacities. Several efforts have been made in the past on the part of a limited number of operators to bring about a semblance of standardization along these lines, but as yet no great degree of success has been attained. It is not greatly to the credit of the truck tank user that further progress has not been made in this direction.

The tank truck of yesterday overshadowed the mule drawn tank wagon in the same degree as it is in turn overshadowed by the tank truck of today. The tank truck of tomorrow? If the same degree of improvement is maintained in the future as in the past, possibly the next generation of truck drivers will marvel at the hardships endured by their predecessors away back in the year 1930 A. D!

World's Largest Tank Truck Put in Service

CLEVELAND

THE Eastern Oil & Gas Corp., Riverhead, N. Y., recently placed in service the largest tank truck in the world. The semi-trailer tank has a capacity of 5000 gallons.

The unit is in operation most of the time between the Tide Water Oil Co. plant at Fort Jefferson, L. I., and the Eastern bulk station at Riverhead, a distance of about 25 miles. Now and then it makes a longer trip to other Eastern stations.

There is no direct rail line between the Tide Water and Eastern plants so that delivery was complicated. As now worked out the unit takes the place of a tank car.

The truck tank mounted on the unit was designed and built by the Davis Welding & Manufacturing Co. of Cincinnati. It is a 4-compartment job incorporating special Davis features such as Groundtite emergency valves, emergency valve control, Quixeal manholes, fabricated steel cross bolsters, underslung can boxes, 3-inch manifolded piping and 3-inch gate valves built into underslung cabinets, runways on top of tank with ladder, etc.

A special designed drop frame semi-trailer was built for the unit by the Fruehauf Trailer Co. It, as well as the White Model 64 tractor, is equipped with tandem axles and dual pneumatics. The unit is equipped with eighteen 9.75-20 balloon tires.

The gross weight of the unit is 60,000 pounds. The overall length is 38 feet. The maximum load is 412 pounds per inch width of tire.

Before the unit was built it was necessary to obtain passage of an amendment to the state highway laws in New York recognizing that tandem axles are two separate axles. With this law amended permission to operate the vehicle was obtained from the New York commissioner of highways.

5000-Gallon semi-trailer recently placed in service by the Eastern Oil & Gas Corp., Riverhead, N. Y.

Modern Truck Reduces Bulk Plant Duplications and Stocks

By A. F. Coleman*

(Presented before American Petroleum Institute, Chicago, November 1930)

SERVICE, without regard to cost, was one of the features which aided materially in building Standard Oil Co. predominance in the early days. Bulk plants were placed at strategic locations; sites to handle loads were carefully selected on the water fronts. From such points, land cargoes were shifted to floating bottoms or moved inland from the coast.

Bulk plants were also located at railroad sidings, close to populous districts and near the refineries. Sub-stations or relay points were grouped about the main plants, at distances from 5 to 10 miles, it being necessary to plan operations in terms of horse-drawn vehicles, thereby limiting operations to about 15 miles per day. The automobile at that time was only a prediction.

The practice in the small substations was to place one man in charge. He was manager, tank wagon driver, chief clerk, collector, stableman, stock clerk, and odd job man. He handled everything, and became the Standard Oil Co. in his little community. He was a loyal and faithful employee, a hard worker, and a good citizen.

Time worked great changes in the industry. The automobile, introduced about the end of the nineteenth century, opened a market for gasoline, which had earlier been a by-product of the refineries. Lubricating oil available at that time was not satisfactory for the gas engine. A new type lubricant had to be refined to withstand the higher operating temperatures of the internal combustion engine, which meant that greater stocks had to be carried at our plants. Garages in cities soon spread to the country districts; filling stations appeared at crossroads; passenger cars came into favor and grew in number; roads were improved, and changed in character to carry heavier loads—but the horse lingered on in the delivery field, motor trucks at this early date being considered an expensive luxury.

*Standard Oil Co. of New York.

The additional business, the increased radius over which business must be done, made motor transportation inevitable. Eventually motor trucks began to find their way into the field—generally into the hands of the old tank wagon drivers who acted as our first chauffeurs and supervisors. These old trucks, the first recruits, the vanguard of our present fleets, were an odd lot of machinery, poorly engineered when compared to our present equipment. The tanks and special equipment which were mounted on them were necessarily makeshifts, because there was no experience on which to base vehicle design. As crude as they now seem, they carried on and earned a place in the Hall of Fame, where Mr. Ford now proposes to perpetuate them.

Trucks then could not be selected, as they are today, to meet special requirements. There was no opportunity to specify definite spring changes, tire capacities, wheel bases, or engine sizes. There were no three-axle trucks and no trailers. Operators were faced with a limited range of capacities and makes, and had little practical or technical automotive knowledge to guide their choice. The outcome was disheartening. In many companies trucks were considered a necessary evil. Owners simply buried their heads in the sand and hoped the trucks would run themselves. They wished only to forget them.

With the development of trucks and with changed marketing conditions, a different delivery system was necessary. Business both at main and substations had to keep pace with the increase in passenger cars,

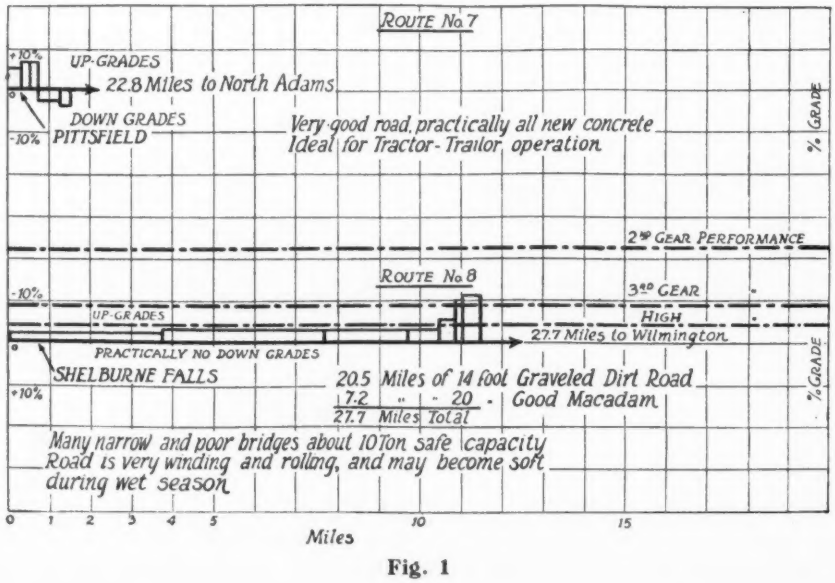

Fig. 1

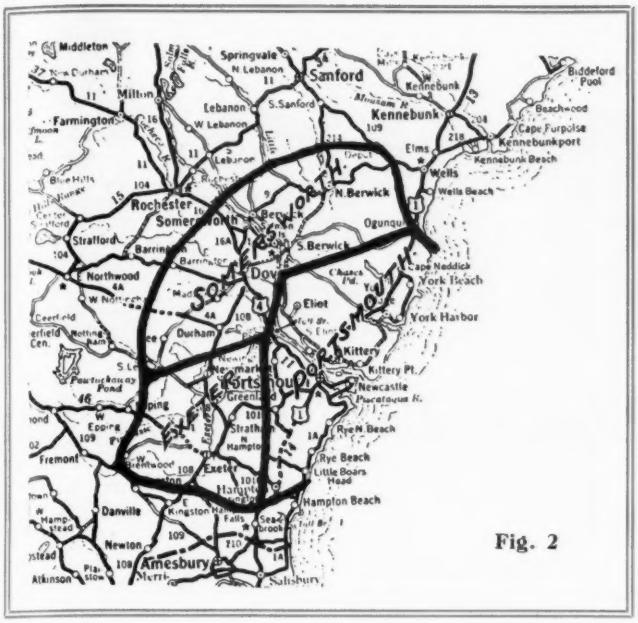

Fig. 2

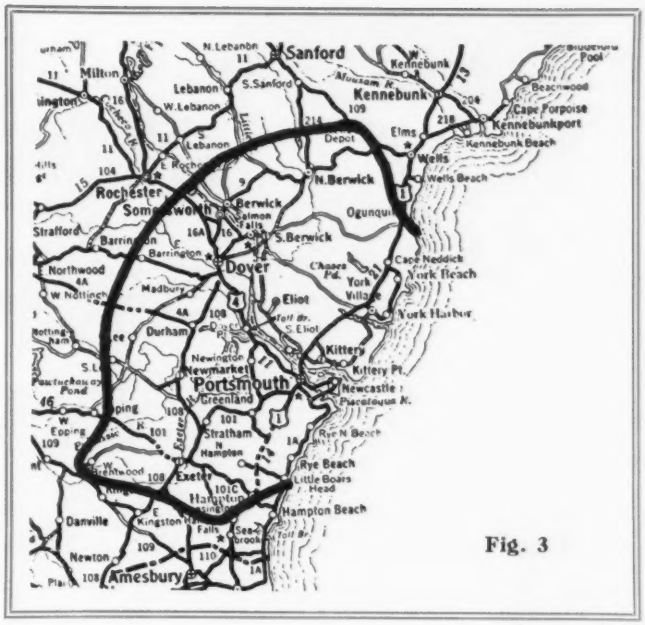

Fig. 3

trucks and buses. More manpower was needed at the one-man station. The driver was promoted to sub-station manager. Primarily a marketing man, his knowledge of motor trucks and equipment was not abreast of progress in the industry. Slowly owners and directors were becoming "truck conscious." One by one they removed their heads from the sand, and began to realize that trucks could be an asset, instead of a liability, if adapted to the job and correctly handled and supervised.

Trucking problems soon became tied up with marketing problems. Where a day's work for a horse was 15 miles, a truck would operate over a radius of 40 to 45 miles; later the hauls became even longer.

Nevertheless, in the beginning we used horses for local deliveries; but with experience the truck forced the horse more and more out of the picture. Consolidation at stations resulted; many of our old plants were dismantled, and their business distributed among more distant plants.

With faster vehicles, operating on pneumatic tires, deliveries were again expedited. Today there is still further consolidation and more refined study of our marketing conditions.

Changes in our plan of operations were comparatively simple at the beginning, as we had relatively high delivery figures on which to base new economies. But as new installations of equipment reduced our delivery costs, our problem became more difficult, so that at present it is necessary to make a thorough survey of each new proposed route.

By referring to Fig. 1 it will be noted this covers a survey of two routes in the Boston field. Grades are represented by rectangles, their height showing the average grade; their width, length of the grade; rectangles above the line are up-grades, and below the line down-grades.

A detailed survey, not included in this paper, furnishes a complete description of the type and character of the road surfaces, capacity of any bridge which must be crossed, radius of any short curves, and other necessary information.

Knowing the potential gallonage which must be moved over the road and the length of the haul, it becomes a simple problem to determine the numbers and sizes of trucks required to move the product. The size of truck is of necessity limited by road conditions, capacity of bridges, or by legislation.

From a marketing viewpoint, we are also confronted with limitations, depending on the product hauled and the nature of the deliveries along the route.

These limiting and controlling factors must be decided. The truck manufacturers are then asked to furnish a chassis capable of a definite performance on the grades and roads, and different speeds as shown on the chart. This removes much of the guesswork which characterized earlier operating methods, and makes it possible scientifically to predict results within a narrow range of error. Reviewing our costs after these similar revisions have been made, we find that the apparent actual cost of transportation of 100 gallons of gasoline from a central point to one of the more distant stations has not diminished perceptibly in cost per gallon, due to the much larger radius over which deliveries are now made. But even though the actual cost itself is not perceptibly less, there is a considerable saving to the company, due to decreased real estate investment and the elimination of such items as maintenance of plant and plant equipment, labor and additional tankage for products, and particularly due to the saving in investment represented by large stocks of products in storage at these small plants.

It was sometimes necessary, in order to take advantage of carload freight rate, to store a year's supply of a particular product at one of these relay stations.

To give a concrete example of this condition, we show herewith two maps: Fig. 2 showing the original set up at Ports-

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"Bulk hauling" brings source of supply (refinery, pipeline, bulk plant or tan car) closer to sales outlets—a new economy in handling large dumps at points o fast turn-over with fewer motor trips.

Major refiners, with plants close to large markets, have adapted FARREL Train Trailers with surprising reductions in costs and delivery time—larg jobbers serving a wide market from a central bulk station have reduced trips, mad larger dumps per trip and substantially increased profits.

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Everyone is deeply concerned with the problem of "bulk hauling"—*the ne and modern method of cutting costs.* Why not now ask our Engineering Depar ment to consult with you—no obligation.

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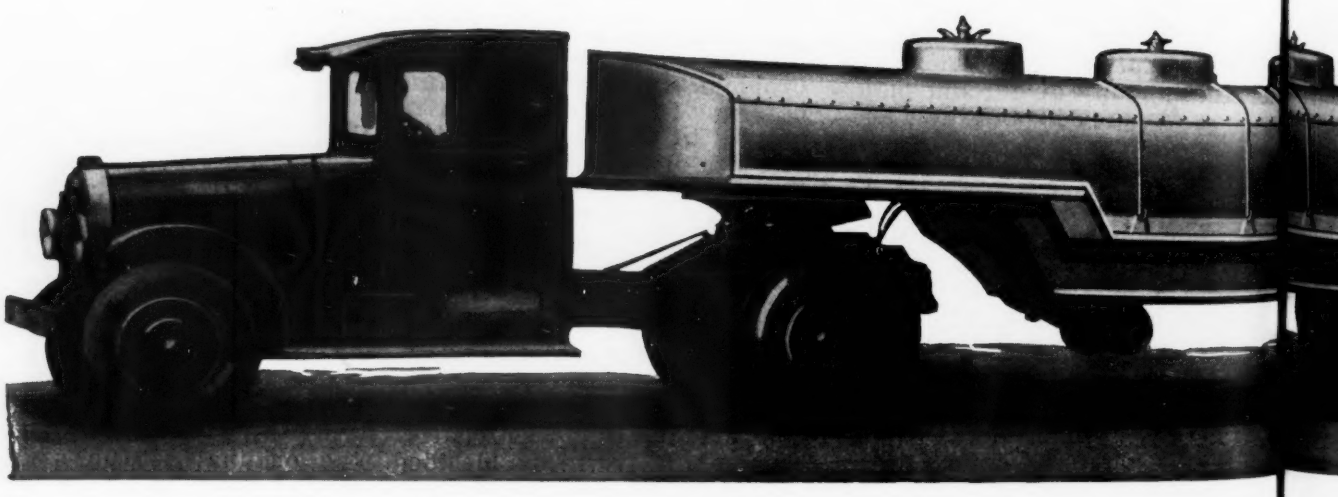

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mpartments are separable as in all FARRELL tanks. The tanks
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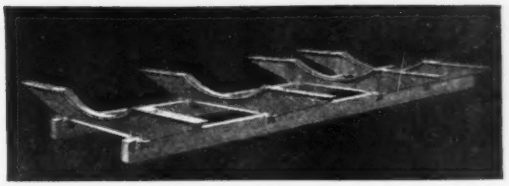

The FARRELL Cushioned *Steel* Underframe Bolster

There is no part of a tank assembly that is subject to as much severe service and strain as the underframe or bolster. It takes road shocks coming up and must withstand liquid surge downward, end and sidewise.

The life of the tank depends on its underframe —it is not only the tank carriage—it is a bumper between the tank and the frame.

The FARRELL underframe is an engineering achievement—embracing the most advanced principles of load stresses.

Plate and angle construction of exceptional strength and rigidity yet no excessive weight. The top angles carry a wide band of steel—*this forms a cradle.* A thick felt filler is placed between tank and cradle. This construction cushions the tank—eliminates wear, friction and noisy rumbling and squeaking. The steel underframe is mounted on strong, long grain, high grade oak sills with an adjustable feature permitting transfer with units of varying frame widths.

The tank is mounted on the underframe and secured by means of encircling tie rods. When mounted the most severe road service will not cause tank vibration or loosening of tie rods—as firm as if they were welded together.

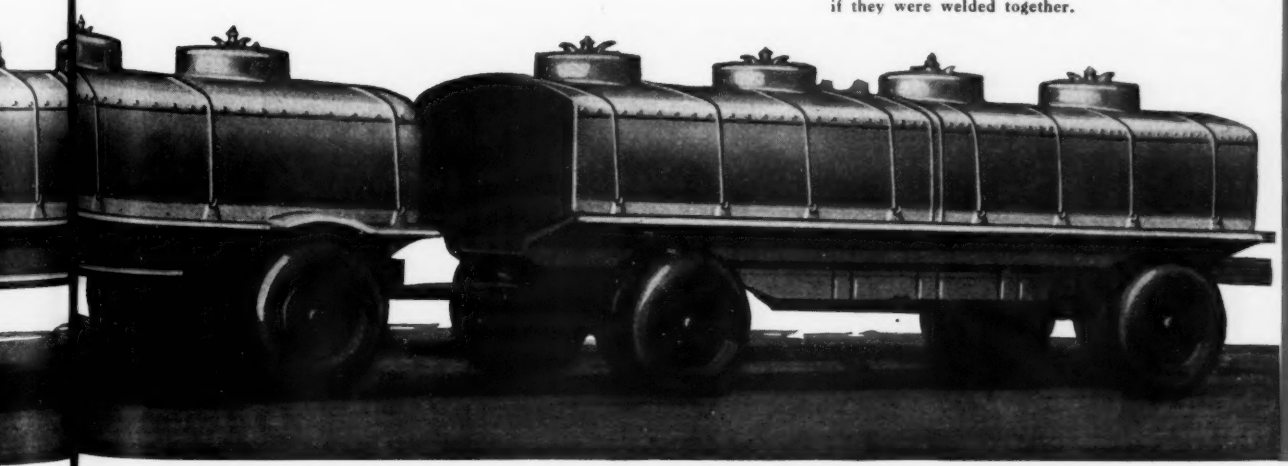

Table 1

Cost of Operating 2,000-Gallon Ferry Service Equipment from Nov. 1, 1928 to May 1, 1929

Equipment		Days Used			Prorated Costs: Chauffeur and Depreciation		Prorated Costs: All Other Costs				Total Barrels Hauled and Total Costs				
Location	Style Make	Run	Repairs	Not in Use	Total Dollars	Per Day Dollars	Total Dollars	Miles Run	Per Mile Cents	Per Day Dollars	Barrels Hauled	Amount Dollars	Per Barrel Cents	Per Mile Cents	Per Day Dollars
1	No. 1	89	2	..	726.63	8.16	323.09	5,785	5.58	3.64	12,290	1,049.72	8.54	18.15	11.80
2	No. 1	131	17	..	626.24	4.78	926.14	7,015	13.20	7.07	17,214	1,552.38	9.02	22.12	11.85
3	No. 1	125	9	..	833.56	6.67	1,026.30	6,284	16.33	8.21	16,233	1,859.86	11.46	29.60	14.88
4	No. 1	141	5	2	1,104.03	7.83	838.85	9,756	8.62	5.95	16,090	1,942.88	12.08	19.96	13.78
5	No. 2	54	22	..	227.92	4.22	672.48	3,516	19.11	12.45	8,567	900.40	10.51	25.60	16.67
6	No. 2	47	1	1	189.90	4.04	845.33	3,319	25.47	17.98	6,330	1,035.23	16.35	31.18	22.02
7	No. 2	61	21	..	243.76	4.00	515.29	3,808	13.52	8.44	9,782	759.05	7.76	19.93	12.44
8	No. 2	49	3	..	201.19	4.10	603.08	3,056	19.73	12.31	7,934	804.27	10.14	26.31	16.41

mouth, N. H. (which plant had sub-stations at Exeter, Somersworth, and Dover) and the tank wagon routes for each of these points are shown. Fig. 3 shows the present set up, with the tank wagon routes all covered from Portsmouth, eliminating the sub-stations Exeter, Somersworth, and Dover.

Portsmouth is an old seaport town located on the Piscataqua River. It was settled in 1623, long before petroleum was a factor in the country's business. It is in the direct path of thousands of tourists who enter the state of Maine each year.

Exeter is southwest about 17 miles, and Dover 12 miles north of Portsmouth. In the heart of Dover are the Pacific Mills, manufacturers of cotton products. Four miles from Dover to the north is Somersworth, which has the largest individual mill under one roof. Surrounding Somersworth are many small towns supporting small factories of various kinds.

Bulk plants have been maintained by the company at each of the above mentioned places for a number of years. Products were received by boat at Portsmouth and ferried to each bulk plant by two trucks and trailers. An office, garage, and warehouse were maintained at Exeter and Somersworth; Dover being a relay under Somersworth. Therefore, it required agents, clerks, yardmen, and a number of drivers.

The motor equipment used at these stations was of two-ton type with solid tires and governed to about 15 miles per hour. Exeter supported 2 tank trucks and 1 dray. At Somersworth we operated 3 tank trucks, 2 convertible trucks, and 1 dray. Portsmouth operated 6 tank trucks and 2 drays.

It was decided to handle all products from the Portsmouth plant. Many customers in the Exeter and Somersworth territory entered a protest, claiming they would be unable to receive the service they had in the past, due to the fact that Portsmouth was located a great distance from some of the dealers. However, since the new service has been inaugurated, complaints have ceased and our customers comment on improved deliveries.

This combined territory required 13 tank trucks, 4 drays, and 2 ferry trucks and trailers. Since January 1930 the total territory has been operating from the Portsmouth plant with the following equipment: Three 2½-ton trucks; two 3-ton trucks, each equipped with one thousand-gallon tanks with four compartments; one 3-ton truck, equipped with a thousand-gallon tank with four compartments, also a power pump with meter for the distributing of furnace and fuel oil, one 1½-ton truck having a seven hundred and fifty-gallon tank with three compartments, one 1-ton dray truck, and two ferry units. All of these trucks are of the modern type.

The personnel has been reduced in proportion to the trucks, and the cost of upkeep of the trucks has been reduced to a minimum. The customers are receiving the same, or better, service than before, and in almost every town they receive two deliveries each day.

At the present time each truck averages 68 miles per day, with a monthly average of 90,000 gallons per truck. The operators of these trucks receive one afternoon off each week; we maintain one spare man to operate the truck when the regular driver is off, so that we secure full efficiency from each vehicle.

The round-trip wagon circuits were increased from 35 miles to 60 miles; but by changing from the old type trucks with solid tires to the newer, faster type on pneumatics, we have been able to reduce our equipment at this point from 21 pieces to 12, delivering more products with the 12 than with the previous 21.

It is, therefore, demonstrated

Table 2

Cost of Operating 2,000-Gallon Trailers Ferry Service Equipment from Nov. 1, 1928 to May 1, 1929

Equipment		Days Used			Prorated Costs: Chauffeur and Depreciation		Prorated Costs: All Other Costs				Total Barrels Hauled and Total Costs				
Location	Style Make	Run	Repairs	Not in Use	Total Dollars	Per Day Dollars	Total Dollars	Miles Run	Per Mile Cents	Per Day Dollars	Barrels Hauled	Amount Dollars	Per Barrel Cents	Per Mile Cents	Per Day Dollars
9	.....	52	..	17	102.26	1.96	118.88	4,724	2.52	2.29	4,402	221.14	5.02	4.68	4.25
10	.....	32	..	..	53.15	1.66	150.03	2,340	6.41	4.68	3,662	203.18	5.55	8.68	6.34
11	.....	48	..	..	87.65	1.83	113.67	4,231	2.69	2.36	3,916	201.32	5.14	4.75	4.19
12	.....	45	..	..	73.47	1.62	115.07	3,619	3.18	2.58	6,512	188.54	2.90	5.22	4.20

Table 3

Comparison of Operating Trucking Costs and Other Factors for the Various Divisions for the Year Ending Oct. 31, 1929

	1,500-Gallon Trucks Divisions			2,000-Gallon Trucks Divisions		Trailers		
	1	2	3	2	3	1 1,600-Gal.	2 1,500-Gal. 2,000-Gal.	3 2,000-Gal. 2,800-Gal.
Days run in ferry service	3,852	664	5,094	5,476	3,161	2,261	5,667	1,473
Miles run	320,905	45,276	445,017	474,125	280,959	173,750	496,348	149,240
Average miles per day	83	68	87	87	89	77	87	101
Number of trucks	28	4	22	25	15	18	31	8
Average miles run per truck	13,325	11,319	20,228	18,965	18,731	9,542	16,011	18,655
Average days run per truck	153	166	232	219	211	129	183	184
Days under repairs	1,113	128	958	1,035	866	725	924	288
Average days under repairs, per truck	49	32	44	41	58	40	30	36
Days out of service	1,939	40	648	259	655	2,432	1,243	217
Average days out of service, per truck	79	10	29	10	44	135	40	27
Per cent of time trucks not in ferry service	46.9	25.8	28.0	20.3	33.2	59.5	27.9	25.9
Barrels hauled	226,008	69,518	444,536	672,465	345,998	129,000	533,064	161,740
Total cost	$74,885	$10,426	$101,694	$102,114	$81,572	$9,985	$23,100	$9,175
Average cost per barrel	33.13c	15.00c	22.88c	15.20c	23.58c	7.74c	4.33c	5.67c
Average cost per mile	23.34c	23.03c	22.86c	21.54c	29.03c	5.75c	4.65c	6.15c
Average cost per day	$19.44	$15.70	$19.96	$18.65	$25.81	$4.42	$4.08	$6.23

that, with modern equipment and proper routing of trucks, the operating expenses can be reduced.

This example is chosen because of the fact that road conditions in New Hampshire are perhaps as unfavorable as any in our territory. The authorities find it necessary during certain seasons of the year to place low load limitations on the highways, as rains and spring thaws soften the road surfaces.

In a section of the New York City metropolitan area we made a sweeping change in our method of delivery. Conversion from old solid-tire trucks to the high-speed pneumatics made it possible during the period from January 1, 1930 to June 30, 1930 to reduce the number of trucks 36 per cent, and at the same time to increase the gallons hauled 53 per cent.

A cost analysis of this change does not reflect a saving in cost-per-gallon delivery that one would expect, due as, in the previous case, to much longer delivery routes. The change, however, made possible elimination of a number of small substations and a consequent saving as in the New Hampshire operation.

Having before them the savings which have been effected by the introduction of trucks into our delivery service, our distribution department figured, with the assistance of the automotive department, that gasoline—for short hauls up to approximately 50 miles—could be transported, in large bulk or for wholesale delivery, by motor truck at a lower cost than by freight.

This is history to most of us now; but as a matter of interest, Table 1 shows one method of consolidating costs on this type of service, which our company designates as "ferry trucks."

The first four lines show the cost on one make of truck, and the second four on another make. Numbers have been substituted for the cities under the heading "location," as well as for the divisions, as the names would add no value to the table.

Table 2 shows similarly collected costs for trailers. To arrive at the actual cost of transportation for the product the two figures must be averaged.

Table 3 is a recapitulation of a large number of cost records, similar to the ones shown briefly in Tables 1 and 2 and covers a year's operations. These figures may cause some comment, favorable or otherwise; but few corporations have identical methods of cost accounting. Until such a uniform method is decided upon, it will be difficult to determine which costs are lower or higher—unless there are available all elements that go to make up that cost.

The following short tabulation was prepared from available records. It shows the actual savings made by ferry service (as compared to freight rates) in cents for 50-gallon barrels:

Barrels of 50 gallons transported in bulk	Savings per barrel
300,000	31.80
1,000,000	34.73
38,000	32.10
400,000	29.75

This paper has been confined strictly to the transportation of petroleum products, augmented only by a few figures and tables. No single paper could comprehend the whole subject matter of economies in automotive transportation. We feel that we have demonstrated sufficiently how modern equipment can be managed, scientifically and economically, at the same time insuring the all-important sales factory service to customers—our first consideration now, as at the outset.

Foreign Opportunities

Reserved information may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, and its district and cooperative offices by duly registered firms and individuals upon written request by opportunity number. The Bureau does not furnish credit ratings or assume responsibility as to the standing of foreign inquirers; the usual precautions should be taken in all cases, and where no references are offered it does not necessarily imply that satisfactory references could not be given. Correspondence may be in English unless otherwise stated.

47531.—**Petrolatum and ointment raw materials,** Rotterdam, Netherlands, purchase and agency.

47547.—**Motor oils,** Hamburg, Germany, purchase.

47643.—**Kerosine,** Lisbon, Portugal, purchase or agency.

47334.—**Asphalt,** Hamburg, Germany, agency.

47735.—**Asphalt and high fusible bitumen,** Berlin, Germany, purchase or agency.

47755.—**Petrolatum,** Hamburg, Germany, purchase or agency.

47757.—**Bitumen,** Wellington, New Zealand, purchase or agency.

47786.—**Paraffin,** Hamburg, Germany, purchase.

47824.—**Scale and refined paraffin,** Dublin, Ireland, purchase.

IS YOUR PROBLEM DIFFERENT?

One of the Fruehauf Tank Semi-Trailers used by Skelly Oil Company in deliveries to service stations and customers. It hauls 1300 gallons of Gasoline, as well as lubricating Oil in cans. Equipped with tank by Standard Steel Works, GMC tractor-truck and B-K brakes.

DURING the past three years, scores of Oil organizations—large, small and medium size—have trailerized their transportation equipment with Fruehaufs and effected large savings.

Fruehaufs are hauling 5000, 6000, 7000 and 8000 gallons per trip from point of supply to bulk station, and showing astonishing savings over previous methods of transportation.

In every section of the country, light tractor-trucks are hauling gasoline in Fruehauf Tank Semi-Trailers for service station and customer delivery—with savings that range from *30% to 50%!*

Actual performance has demonstrated that Fruehauf Trailers are just as practical on *short hauls* as they are in long-distance haulage.

And the modern trend in Gasoline transportation is certainly to the Trailer—the acceptance of the Trailer idea by practically every major company in the country being conclusive proof of its value.

Your haulage problem may or may not be different from many others with which we are familiar. Careful analysis will enable us to determine the most economical solution from your standpoint—and our recommendations will be placed before you without obligation.

Oldest and Largest Manufacturers of Trailers

Branches and Distributors in All Principal Cities

FRUEHAUF TRAILER COMPANY 10962 HARPER AVENUE DETROIT, MICHIGAN

Fruehauf Trailer Company of Canada, Ltd., Toronto, Ontario, Canada

FRUEHAUF TRAILERS

"Engineered Transportation"

SEMI-TRAILERS

What One Company Has Done to Increase Fleet Capacity with Fewer Motor Pieces

By Roger B. Stafford
N. P. N. STAFF WRITER

CLEVELAND

BY USING semi-trailers the National Refining Co. of Cleveland has been able to deliver more gallons of gasoline with fewer pieces of equipment than it was able to deliver when it depended wholly upon tank trucks.

The National Refining Co. bought its first semi-trailer job a year and a half ago. Today it has more than 100 such pieces of motor equipment. Except for low gallonage delivery units in rural districts, it is buying only semi-trailer equipment for its motor transport department.

In some of its marketing centers the National has been able approximately to quarter the cost per gallon of delivering gasoline to retail outlets. Many are the instances in which it has been able to halve the cost.

With 18 months' experience behind it, National is convinced that semi-trailers are today's method of delivering gasoline to service station and dealer outlets and the larger commercial and farm accounts. It has found that semi-trailers have many advantages over tank trucks wherever the monthly deliveries exceed a minimum of 14,000 gallons.

The National has been using semi-trailers in all kinds of country, level and mountainous. It has been using them in all sorts of weather and over all sorts of roads.

It has found that a 2½-3-ton truck tractor will get a 1500-gallon load of gasoline weighing 9300 pounds to its destination without difficulty where a 5-ton truck with the same load would falter. It has found that a 1½-2-ton tractor can pull a 750-gallon load weighing 4650 pounds easily over roads where a 3-ton truck with the same load would have a hard struggle.

It has never had a semi-trailer loaded with gasoline upset. It has had upsets with trucks. It has had comparatively light tractor units pull a semi-trailer loaded with gasoline out of snow banks where trucks of higher power would have to get assistance.

The lighter tractor unit requires less gasoline and oil to operate than the higher powered truck unit to haul the same load the same distance. The tractor with semi-trailer can make higher speeds on the road. It can get away faster after stops than the truck. Frequently it is possible to eliminate four or five trucks with two or three semi-trailer pieces.

It is unnecessary to have as large reserve equipment of motor vehicles when semi-trailers are used. Seldom are the trailer and its tank out of commission. The reserve equipment may consist entirely of one or more tractor units, the number depending upon the size of the operating company's fleet in its territory or division.

The National backs up these assertions with statements of facts taken from its operating records. The assertions are not the claims of a semi-trailer enthusiast. They have been made after more than a year's experience with this type of equipment.

Here are some of the concrete examples which S. A. White, general purchasing agent of the National, uses to back up the company's assertions.

In Cleveland, three pieces of equipment were eliminated when two 3-ton tractors were put into service with 2500-gallon tanks on semi-trailers to supply the same group of stations that had been supplied by five 5-ton trucks with 1600-gallon tanks. Last August the semi-trailers delivered 126,000 gallons each. One traveled 904 miles in 26 working days and the other 820 miles. The company was able to reduce its operating expense more than 60 per cent in this one instance. It saved the wages of three truck drivers and each truck tractor was more economical with gasoline and oil than any of the trucks.

In its St. Louis division National has 48 stake and tank semi-trailers in use. It has only one tractor in reserve. In case a tractor has to go to the shop for repairs the semi-trailer it has been hauling continues in use with the spare tractor. After repairing the one tractor may be returned to its job or it may be placed in reserve.

NATIONAL is using semi-trailers in rural districts but not on routes where the monthly business is less than 14,000 gallons. Below that figure, Mr. White said, it had been found more economical to use a light truck with a tank on its back.

Last winter a semi-trailer with gasoline load became imbedded in a snow drift. The tractor was unable to get sufficient traction in the spot where it was caught. The driver let down the front wheels of the trailer, uncoupled the tractor, pulled out with no load, and backed up to the trailer from

A 2500-gallon semi-trailer with 3½-ton tractor used by National Refining Co. in St. Louis

another angle. The fifth wheel was turned so a coupling could be made and the trailer was pulled free of the drift by the tractor without assistance. It is impossible to maneuver a truck to a spot where traction can be obtained.

The same advantage has been found in getting out of holes in muddy roads of which there are many miles in fall and spring in National's territory in the middle west.

Like most oil companies the National has hesitated to give out average hauling costs because of the varying factors that enter into any transportation cost accounting system. Operating conditions also vary widely even when trucks work out of the same bulk plant, it is said.

However, the two 2500-gallon semi-trailers used in Cleveland are delivering gasoline for less than 1/3 cent a gallon, the cost items covering fuel, tires, wages, insurance, taxes, administrative expense, other overhead, and depreciation on the tractor in three years and on the trailer and tank in 10 years.

The equipment is yet too new for repairs to be a sizeable item but National is writing off the tractors in three years and repairs in the future will hardly equal the present depreciation charge.

The advantages of the semi-trailers may be summarized as follows:

1. Fewer semi-trailers are required to serve a given market than tank trucks because:

a. A truck tractor can pull a larger load than a truck of the same power can carry on its back.

b. Tractors and trailers are speedier than truck tanks of comparable size and are thus able to make more deliveries in a day over a wider territory, thereby permitting the combining of delivery routes.

c. They can be maneuvered more easily, thereby eliminating many tie-ups in deliveries.

2. Semi-trailers are more economical than tank trucks of like capacity because:

a. Smaller power units are required.

b. Instead of writing off the entire hauling unit in three to five years, the smaller and lower priced power unit only needs to be written off in that time. The depreciation of the trailer and tank on which there is relatively little wear, may be extended over a 10-year period.

c. Upkeep is lower per gallon of gasoline transported.

d. Outlay for wages may be lowered for the delivery of a given gallonage because fewer pieces of equipment are required to be used.

e. Less capital is required for reserve equipment because with standard fifth wheels the trailer may continue in service while a reserve tractor may be put in service while another is being repaired.

f. Overhead expense that goes on while equipment is laid up is applied to less dead time because only part of the hauling unit is laid up at any one time.

3. The semi-trailer is a good advertising medium because:

a. It has a streamline build that is more attractive than the top-heavy appearing truck tank.

b. It travels the road like a thoroughbred and not like a draft horse.

c. Its quick getaway at stops and ability to maintain a good pace in traffic does not incur the ill will a slow moving truck incurs these days when everybody awheel wants to get somewhere in a hurry.

4. Semi-trailers permit greater coverage of a territory with service stations but with fewer bulk plants than when tank trucks are used in the supply service. This is because the cruising radius of the semi-trailer outfit is larger on account of its speed and capacity than that of the slower moving tank truck.

ADVERTISING PAGES REMOVED

Crude Production by Fields

By Telegraph—Daily average gross output, by fields in U. S., for week ending with dates below as compiled by A. P. I.

PRODUCTION SUMMARY

	Nov. 8	Nov. 1
Production east of California	1,700,350	1,767,450
Decrease		67,100
Total production in U. S.	2,297,250	2,363,050
Decrease		65,800
Crude oil imports	199,145	152,000
Increase		47,145
Total new crude supply	2,496,395	2,515,050
Decrease		18,655

OKLAHOMA

	Nov. 8	Nov. 1
Allen Dome	14,100	13,550
Asher	1,000	1,050
Asher, West	10,500	7,650
Blackwell	2,900	3,100
Bowlegs	13,400	13,700
Braman	2,900	3,100
Bristow-Slick	13,500	14,100
Burbank	14,800	14,850
Carr City	9,300	10,050
Cromwell	6,550	7,000
Cushing	12,750	13,350
Davenport	1,000	1,050
Duncan District	8,250	8,600
Earlsboro	14,950	18,400
Earlsboro, East	14,500	18,600
Earlsboro, South	8,650	8,500
Fox	1,150	1,200
Garber	4,400	4,650
Graham	3,050	3,200
Healdton	11,450	11,950
Hewitt	6,650	6,950
Hubbard	1,200	1,300
Konawa	16,500	17,600
Little River	22,750	23,800
Little River, East	12,100	11,900
Logan County	4,650	4,700
Maud	3,050	3,100
Mission	5,450	7,150
Oklahoma City	66,750	84,800
Okmulgee, North	9,900	10,100
Okmulgee, South	6,600	6,750
Osage (Outside Burbank)	24,400	24,400
Papoose	2,400	2,550
Pearson	650	700
Sasakwa	4,900	5,250
St. Louis	22,200	21,800
Scholem-Alechem	13,450	13,900
Searight	6,850	6,600
Seminole	13,400	13,600
Seminole, East	2,100	2,150
Thomas	650	650
Tonkawa	5,800	6,100
Wewoka	5,000	5,500
Yale-Jennings	6,650	6,900
Others	56,500	58,600
Total, Okla.	489,650	524,500
Decrease		34,850

KANSAS

Augusta-Fox Bush	2,850	2,900
Churchill	3,500	3,500
El Dorado-Towanda	13,900	13,950
Florence-Covert	800	800
Greenwood County	19,000	19,050
Oxford	2,450	2,500
Peabody-Elbing	2,350	2,350
Rainbow Bend	1,050	1,050
Russell	3,050	3,050
Sedgwick County	28,600	22,900
Voshell	6,000	8,000
Others	34,000	34,300
Total, Kansas	117,550	114,350
Increase		3,200

NORTH LOUISIANA

Caddo, light	8,400	8,300
Caddo, heavy	2,700	2,750
Cotton Valley	1,850	1,850
De Soto and Red River	2,900	2,950
Haynesville	5,250	5,150
Holly	1,200	1,000
Homer	3,350	3,400
Sarepta		
Carterville	2,500	2,800
Urania	5,350	5,450
Zwolle	8,700	7,550
Others	1,700	1,700
Total, North Louisiana	43,900	42,900
Increase		1,000

ARKANSAS

Champagnolle	3,450	3,700
El Dorado	3,900	4,050
Lisbon	900	850
Nevada	1,000	1,000
Smackover, light	4,850	4,950
Smackover, heavy	35,800	36,350
Stephens	900	900
Others	1,250	1,250
Total, Arkansas	52,050	53,050
Decrease		1,000

ROCKY MOUNTAIN

Wyoming

Big Muddy	2,050	2,000
Elk Basin	800	800
Grass Creek	2,150	2,050
Labarge	1,800	1,650
Lance Creek	250	200
Lost Soldier	3,150	3,900
Oregon Basin	2,550	2,550
Rock River	2,100	2,100
Salt Creek	28,900	28,450
Others	4,100	5,000
Total, Wyo.	47,850	48,700
Decrease		850

Montana

Cat Creek	1,100	1,100
Pondera	1,650	1,350
Sunburst	2,550	5,100
Others	50	50
Total, Mont.	5,350	7,600
Decrease		2,250

Colorado

Florence	400	650
Fort Collins	1,100	1,100
Moffat (Craig)	1,300	1,300
Others	1,500	1,450
Total, Colo.	4,300	4,500
Decrease		200

New Mexico

Artesia	550	550
Bal. Eddy Co.	100	100
Hobbs High	34,200	32,400
Bal. Lea Co.	7,400	7,500
Hogback	450	450
Rattlesnake	1,150	1,150
Table Mesa	100	100
Total, N. M.	43,950	42,250
Increase		1,700
Total, Rocky Mountain	101,450	103,050
Decrease		1,600

TEXAS

(OUTSIDE GULF COAST)

Panhandle District

Carson Co.	6,900	7,300
Gray Co.	57,100	55,850
Hutchinson Co.	18,000	16,900
Wheeler Co.	800	450
Others	1,350	650
Total, Panhandle Tex.	84,150	81,150
Increase		3,000

North Texas

Archer Co.	13,300	13,550
Burkburnett	7,800	7,850
Electra	10,350	10,400
Iowa Park and K. M. A.	4,550	4,600
Montague-Cooke	9,300	9,300
Wilbarger	15,500	15,500
Others	1,800	1,900
Total, North Texas	62,600	63,100
Decrease		500

West Central Texas

Brown Co.	5,200	5,400
Callahan Co.	3,100	3,000
Coleman Co.	2,450	2,600
Eastland-Desdemona	4,950	5,300
Jack Co.	2,200	2,250
Palo Pinto Co.	450	500
Shackleford Co.	5,200	5,650
Stephens Co.	5,400	5,300
Throckmorton Co.	650	700
Young Co.	14,500	14,700
Others	2,000	2,000
Total, West Cent. Tex.	46,100	47,400
Decrease		1,300

West Texas

Crane and Upton Co.'s	35,900	35,500
Crockett Co.	2,100	2,100
Ector Co.	5,250	8,350
Howard Co.	29,400	31,600
Jones Co.	1,400	1,300
Mitchell and Scurry Co.'s	2,200	2,200
Reagan Co.	26,150	26,200
Winkler Co.	58,100	60,300
Yates	102,600	106,100
Bal. Pecos Co.	3,050	3,000
Others	6,550	6,900
Total, West Texas	272,700	283,550
Decrease		10,850

East Central Texas

Boggy Creek	2,600	2,600
Corsicana-Powell	5,400	5,350
Currie	300	300
Mexia	4,100	4,050
Nigger Creek	200	200
Richland	200	200
Van Zandt	27,550	28,100
Wortham	700	700
Total, East Cent. Tex.	41,050	41,500
Decrease		450

Southwest Texas

Chapmann Abbott	8,300	7,850
Dale	300	300
Darst Creek	30,500	47,500
Laredo Dist.	13,550	13,550
Luling	9,850	10,000
Lytton Springs	800	800
Salt Flat	15,600	16,300
Somerset	1,500	1,550
Others	550	500
Total, Southwest Tex.	80,950	98,350
Decrease		17,400
Total, Texas (Outside Gulf Coast)	587,550	615,050
Decrease		27,500

GULF COAST

Coastal Texas

Barbers Hill	19,400	20,250
Batson	1,150	1,150
Big Creek	3,400	3,700
Blue Ridge	1,650	1,650
Boling	950	950
Damon Mound	700	700
Esperson	3,000	2,900
Fannett	650	650
Goose Creek	4,250	4,400
Hankamar	2,200	1,650
Hull	7,800	7,600
Humble	13,900	18,500
North Dayton	1,700	1,900
Orchard	2,300	2,150
Orange Co.	2,100	2,200
Pettus	8,300	7,500
Pierce Junct.	11,150	10,500
Port Neches	1,500	1,450
Raccoon Bend	8,350	8,900
Refugio Co.	26,500	24,050
Saratoga	1,200	1,200
Somerville	1,100	2,300
Sour Lake	2,200	2,200
South Liberty	3,100	3,100
Spindletop	14,500	14,750
Sugarland	12,000	12,300
West Columbia	4,150	4,300
Others	2,450	2,300
Total, Coastal Texas	161,650	165,200
Decrease		3,550

Coastal Louisiana

E. Hackberry	2,050	2,000
Old Hackberry	800	950
Edgerly	400	500
Evangeline	2,000	2,000
Lake Barre	2,400	2,500
Lockport	3,900	3,600
Port Barre	2,550	2,800
Sulphur Dome	2,600	3,250
Vinton	5,500	5,900
White Castle	1,050	1,050
Others	4,000	3,400
Total, Coastal La.	27,250	27,950
Decrease		700
Total, Gulf Coast	188,900	193,150
Decrease		4,250

CALIFORNIA

Dominguez	10,000	10,000
Elwood-Goleta	33,000	37,500
Huntington Beach	28,000	28,000
Inglewood	15,300	15,300
Kettleman Hills	25,500	25,500
Long Beach	98,600	98,500
Midway-Sunset	59,000	59,000
Playa del Rey	35,000	32,000
Santa Fe Spgs.	96,300	94,000
Seal Beach	18,400	19,000
Ventura Ave.	46,300	45,300
Others	131,500	131,500
Total, Calif.	596,900	595,600
Increase		1,300

EASTERN

(Not including Mich)	112,000	114,000
Decrease		2000

MICHIGAN

Mt. Pleasant	4,800	4,850
Saginaw	200	200
Total, Mich.	7,300	7,400
Decrease		100

Compilation Of Mid-Continent Refinery Operations

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Mid-Continent Refinery Operations, Week Ended Nov. 7 (By Telegraph)

	Kansas	Oklahoma	North & Cent. Texas	West Texas	North La.-Ark.	Total Week Ended Nov. 7
Plants Reporting	12	29	25	15	12	93
Da. Av. Cap. (Bbls.)	94,000	161,700	106,100	82,000	77,000	521,300
Da. Cracking Capacity	30,700	52,600	17,200	5,000	22,700	128,200
Da. Av. Crude Runs	52,899 — 1.1	95,636 — 4.3	61,412 — 6.5	35,998 + 11.7	27,522 — 31.2	273,467 — 6.1
Da. Av. Other Oils	11,475 + 0.09	2,148 — 69.3	3,520 + 22.1	5,004 — 9.0	16,545 + 2.7	38,692 — 9.9
GASOLINE—Gallons						
Stocks, Oct. 31	14,804,000	36,173,000	27,501,000	11,650,000	8,808,000	98,936,000
Prod. 10-31 to 11-7	9,946,000 — 5.6	15,458,000 — 12.2	9,033,000 — 10 9	4,244,000 — 11.8	4,858,000 — 24.5	43,539,000 — 12.1
Ship.10-31 to 11-7	10,575,000 + 16.6	16,320,000 — 11.4	8,715,000 + 0.2	5,228,000 + 48.9	5,216,000 — 12.7	46,054,000 + 0.8
Stocks, Nov. 7	14,175,000 — 4.2	35,311,000 — 2.4	27,819,000 + 1.2	10,666,000 — 8.4	8,450,000 — 4.1	96,421,000 — 2.5
Ratio Sales to Prod.	106.3%	105.6%	96.5%	123.2%	107.4%	105.8%
KEROSINE—Gallons						
Stocks, Oct. 31	8,861,000	12,615,000	2,619,000	22,000	346,000	24,463,000
Prod. 10-31 to 11-7	2,228,000 — 2.3	1,962,000 — 10.8	1,374,000 — 5.6	16,000 +100.0	63,000 — 82.7	5,643,000 — 10.6
Ship. 10-31 to 11-7	2,295,000 + 3.7	2,262,000 + 18.8	1,552,000 — 2.0	15,000 — 21.1	203,000 — 37.9	6,327,000 + 4.6
Stocks, Nov. 7	8,794,000 — 0.8	12,315,000 — 2.4	2,441,000 — 6.8	23,000 + 4.5	206,000 — 40.5	23,779,000 — 2.8
Ratio Sales to Prod.	103.0%	115.3%	113.0%	93.8%	322.2%	112.1%
STOVE DISTILLATE—Gallons						
Stocks, Oct. 31	5,571,000	4,446,000	653,000	84,000	714,000	11,468,000
Prod. 10-31 to 11-7	181,000 — 40.7	616,000 + 15.1	168,000 — 23.6	100,000 — 4.8	24,000 — 50.0	1,089,000 — 10.2
Ship. 10-31 to 11-7	1,256,000 +366.9	136,000 — 82.7	103,000 — 54.6	80,000 — 52.7	24,000 — 50.0	1,599,000 + 6.8
Stocks, Nov. 7	4,496,000 — 19.3	4,926,000 + 10.8	718,000 + 10.0	104,000 + 23.8	714,000	10,958,000 — 4.4
Ratio Sales to Prod.	693.9%	22.1%	61.3%	80.0%	100.0%	146.8%
GAS OIL—Gallons						
Stocks, Oct. 31	3,561,000	40,698,000	2,761,000	5,462,000	7,018,000	59,500,000
Prod. 10-31 to 11-7	1,506,000 + 49.4	1,260,000 — 36.4	948,000 + 23.6	594,000 — 8.0	2,323,000 + 14.0	6,631,000 + 2.9
Ship. 10-31 to 11-7	1,533,000 + 32.5	2,003,000 — 22.7	1,289,000 +115.9	639,000 + 45.9	2,737,000 + 63.7	8,201,000 + 27.1
Stocks, Nov. 7	3,534,000 — 0.8	39,955,000 — 1.8	2,420,000 — 12.4	5,417,000 — 0.8	6,604,000 — 5.9	57,930,000 — 2.6
Ratio Sales to Prod.	101.8%	159.0%	136.0%	107.8%	117.8%	123.7%
FUEL OIL—Gallons						
Stocks, Oct. 31	28,515,000	49,983,000	70,137,000	20,351,000	17,710,000	186,696,000
Prod. 10-31 to 11-7	4,095,000 + 5.2	5,441,000 — 9.4	6,506,000 — 16.2	5,039,000 + 14.2	3,946,000 — 17.3	25,027,000 — 6.8
Ship. 10-31 to 11-7	4,804,000 + 37.8	2,467,000 — 61.2	6,655,000 — 15.7	6,049,000 + 21.3	4,914,000 + 16.8	24,889,000 — 7.6
Stocks, Nov. 7	27,806,000 — 2.5	52,957,000 + 5.9	69,988,000 — 0.2	19,341,000 — 5.0	16,742,000 — 5.5	186,834,000 +0.07
Ratio Sales to Prod.	117.3%	45.3%	102.3%	120.0%	124.5%	99.4%

Gasoline Produced by Various Methods, Week Ended November 7

	Kansas	% of Total	Oklahoma	% of Total	North & Cent. Texas	% of Total	West Texas	% of Total	Louisiana-Arkansas	% of Total	Total	% of Total
Straight Run	5,929,000	59.6	10,139,000	65.6	5,199,000	57.6	3,402,000	80.2	841,000	17.3	25,510,000	58.6
Cracked	3,184,000	32.0	4,158,000	26.9	1,861,000	20.6	650,000	15.3	2,990,000	61.5	12,843,000	29.5
Natural	833,000	8.4	1,161,000	7.5	1,973,000	21.8	192,000	4.5	1,027,000	21.2	5,186,000	11.9
Total	9,946,000		15,458,000		9,033,000		4,244,000		4,858,000		43,539,000	

+ or — columns are % changed over previous week.

Gasoline Stocks Are Lowered in Mid-Continent

Staff Special—By Telegraph

TULSA, Nov. 11

CRUDE oil run to stills at Mid-Continent refiners that report weekly operating statistics to NATIONAL PETROLEUM NEWS, were reduced 17,800 barrels daily average in the week ended Nov. 7.

Gasoline production was curtailed 6,000,000 gallons. Gasoline shipments were 400,000 gallons more than in the preceding week. The reduction in gasoline output and increase in shipments caused a draft of 2,500,000 gallons on stocks.

Kerosine production was 600,000 gallons less than in the week before. Shipments were almost 300,000 gallons more. Stocks were lowered 600,000 gallons.

Distillate output was slightly less and shipments slightly more. Stocks were reduced 500,000 gallons.

Gas oil stocks were reduced 15,000,000

Summary for the Month

Production and shipments, all reporting refineries, for four weeks ended Nov. 7. Change in stocks figures from Oct. 10.

GASOLINE

	Gallons
Production	188,462,000
Shipments	192,259,000
Net change in stocks	—3,797,000
Ratio sales to production	102.0%

KEROSINE

Production	23,330,000
Shipments	23,022,000
Net change in stocks	+208,000
Ratio sales to production	98.7%

STOVE DISTILLATE

Production	5,611,000
Shipments	6,384,000
Net change in stocks	—773,000
Ratio sales to production	113.8%

GAS OIL

Production	23,318,000
Shipments	27,170,000
Net change in stocks	—3,852,000
Ratio sales to production	116.5%

FUEL OIL

Production	107,782,000
Shipments	109,912,000
Net change in stocks	—2,130,000
Ratio sales to production	102.0%

gallons, all districts sharing in the reduction.

Fuel oil production was cut 1,800,000 gallons. Shipments fell 2,000,000 gallons. Stocks increased 130,000 gallons.

Imperial Refining to Move Office to Chicago

TULSA, Nov. 10.—The Ardmore plant of the Imperial Refining Co. shut down Nov. 1, according to reports current here. The Tulsa office is to be moved to Chicago. W. B. Hassett, president of the company, was understood to be planning to remove to Chicago in the near future.

Mr. Hassett for the past few months has been developing a chain of service stations in Illinois, Missouri and Iowa, with the intention of devoting more of his time to the retail marketing end of the oil business.

The same interests operate the Kettle Creek Refining Co. at El Dorado, Ark., and Mr. Hassett may operate that plant, it was reported, to supply the gasoline for his service stations, or the plant of the Wickett Refining Co., also an affiliated company, might supply the gasoline.

Western Union Seeks Station Outlets

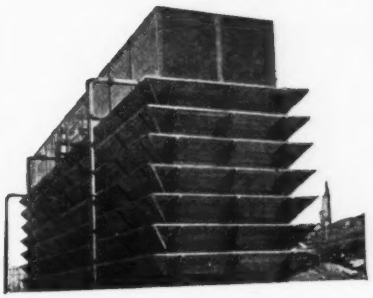
CLEVELAND, Nov. 7.—Service stations are being sought by the Western Union Telegraph Co. as outposts for filing telegrams. Oil men in Michigan have been approached by Western Union representatives to allow posting of a sign announcing that telegrams may be telephoned from the station.

Postal Telegraph has obtained additional outlets through Standard Oil Co. of Ohio stations, and has announced that other Standard Oil companies will be signed up. Postal has the station attendant accept the message, collect the charge. He telephones the message to a Postal transmitting station, leaving the money in a coin box at the phone.

Western Union seeks to place signs at the station informing customers that they can telephone a Western Union office. The attendants do not handle the message or assume any responsibility. Any profit from the message to the oil companies comes through the spending of another nickle in the pay telephone.

SAN FRANCISCO—C. P. Bowie, supervising engineer, has returned to Bureau of Mines offices here after a trip through the Mid-Continent. At Bartlesville, Okla., he attended a meeting of supervising engineers from other bureau offices.

MARLEY EQUIPMENT



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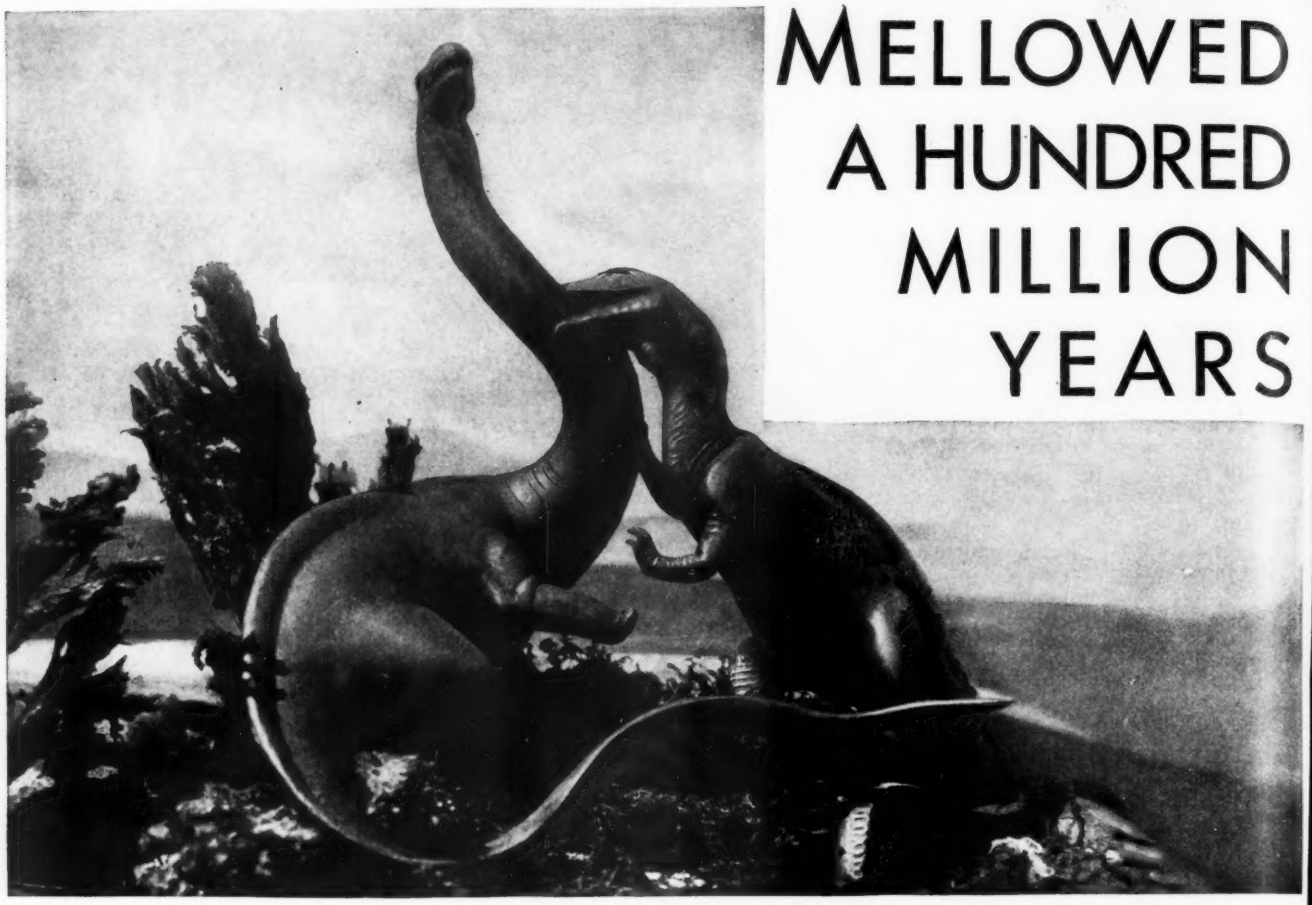

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Refinery - Tank Wagon Markets

Price Trends Mixed in Refinery Markets; Trading Is Dull

CLEVELAND, Nov. 10

PRICE trends in oil markets, both wholesale and retail, were decidedly mixed last week. Tank car markets for gasoline improved in some sections of the country while substantial recessions in prices were reported from other sections.

Local retail gasoline price wars were abandoned in some districts where they had been particularly bad, and at the same time new ones cropped up in other important consuming districts to take their place. General upward and downward retail price revisions also about balanced.

Outstanding among the week's developments marketwise was the discontinuance of export price fixing at the Gulf. Detailed discussion of this is to be found elsewhere in this issue of NATIONAL PETROLEUM NEWS.

Gasoline prices in the middle west experienced their first upward move in nearly three months. This was apparent first in the Chicago market where U. S. Motor advanced 0.125 cent to 4.625 cents on the low of the price range. Markets throughout the Mid-Continent also seemed to be adjusting themselves to this price as a minimum toward the end of the week.

Atlantic seaboard, Pennsylvania and Pacific seaboard gasoline markets continued their downward trends. The Pennsylvania market was the most stable of the three. Price cutting was rampant in the other two markets. Mid-Continent gasoline was reported to be the disturbing factor along the northern Pacific coast.

High lights in retail gasoline markets were a 1-cent reduction in Pennsylvania and Delaware by Atlantic Refining Co.; a 2-cent cut in Arkansas and a 1-cent cut in Tennessee by Standard Oil Co. of Louisiana. The Detroit price war initiated several weeks ago continued unabated.

Aside from home burning oils, other commodities were featureless in all markets. Milder weather in the middle west slowed up the demand for domestic fuels but prices held fairly steady. Colder weather along the eastern seaboard stimulated the demand for these oils and checked a downward move in prices.

Bulk markets at the Gulf were inactive. Exporters on the Pacific coast reported receiving numerous inquiries from the various classes of buyers but little business was said to have been closed.

Gasoline More Active in Chicago Market

Staff Special

CHICAGO, Nov. 8

A MORE active spot demand for gasolines was reported in the Chicago resale market during the early part of the week ended Nov. 8 and prices generally moved higher. Although demand was lighter during the latter half of the week, spot prices generally held steady at the levels reached earlier.

This was the first upward movement in tank car prices since the bullish market immediately following Labor Day and sellers were more or less uncertain as to the cause. Some attributed it to the fact that most of the 4.50 cent U. S. Motor, which had been offered the previous week, had been distress gasoline and quickly taken off the market and also that the sentiment among the jobbers was to the effect that this figure represented the "bottom" price at which Motor was going to move. There apparently was less feeling among the trade that there would be a cut in retail gasoline prices in the near future and this may have helped buying.

Practically all sellers in the Chicago market reported an increase in spot buying among their regular customers. They said that buyers who had been taking only one car at a time ordered two or three cars this week. As reports on gasoline consumption showed no upward movement, evidently a part of this gasoline was going into storage. One jobber located in the northwestern part of the Standard of Indiana territory said he was going to fill his storage, as he believed that the present price level represented a bargain.

Spot tank car prices of U. S. Motor gasoline showed increases of 0.125 cent on the low of the price range, while the high of the price range moved downward fractionally. Sales generally were reported at 4.50 to 5.125 cents on Nov. 3, as against a range of 4.625 to 5 cents later in the week.

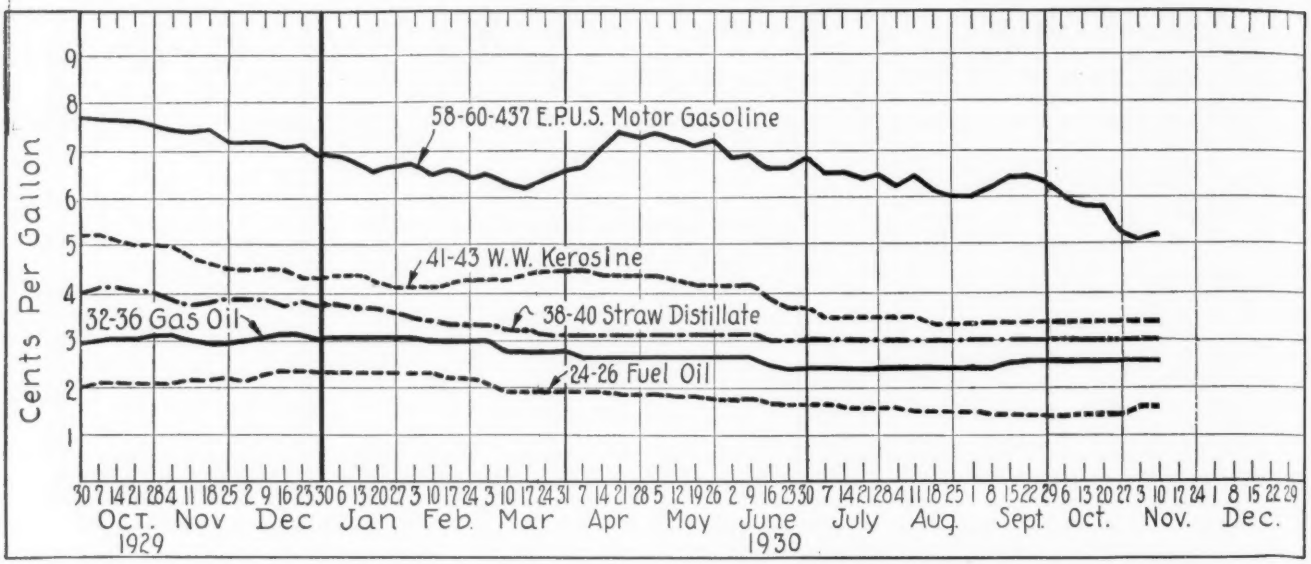
Several carlot marketers, who had sold Motor at 4.50 cents, advanced to 4.625 cents, while others who had quoted the latter figure moved up to 4.75 cents. They generally reported that 4.375 cents was the lowest at which they could buy U. S. Motor for resale and that most refiners asked at least 4.50 cents. Several were "long" some Motor purchased at 4.25 cents, but most of these marketers were getting at least 4.625 cents for it.

Quotations on U. S. Motor gasoline by refiners with offices in Chicago ranged from 4.625 to 5.50 cents, with sales reported at 4.625 to 5 cents.

The demand for higher gravity gasolines was quiet and prices were lower in several quarters. The movement of kerosine continued light, although there was little change in prices.

Milder weather during the past week or so has hampered the demand for distillate and zero gas and fuel oils, but apparently there has been

Current Prices of Principal Mid-Continent Refined Products


Cents Per Gallon
58-60-437 E.P.U.S. Motor Gasoline
41-43 W.W. Kerosine
32-36 Gas Oil
36-40 Straw Distillate
24-26 Fuel Oil
Oct. Nov Dec Jan Feb Mar Apr May June July Aug. Sept Oct. Nov. Dec.
1929
1930

Prices shown are in Group 3 basis and extended to date shown in Refinery Market Tables Section of this issue

no easing of prices for these products. According to most of the trade, there still was no great amount of zero gas oil or 28-30 and 18-22 zero fuel oils and there was little likelihood of any price recessions in these products at present.

Cold weather with rain or snow is likely over most of the Standard of Indiana territory the first part of next week, says the Chicago weather bureau, followed by fair weather with rising temperatures.

Northwest Jobbers To Meet

MINNEAPOLIS.—The Minnesota division of the Northwest Petroleum Association will meet Jan. 14 and 15 at the Radisson Hotel, Minneapolis.

The North Dakota division will meet Jan. 29 and 30 at the Dacotah Hotel, Grand Forks, N. D., according to Elwin E. Hadlick, secretary.

Farm Bureau Distribution Enlarged

INDIANAPOLIS, Ind.—The farm bureaus of Ohio and Michigan have joined the Indiana bureau in organizing the Farm Bureau Oil Company, Inc., for the purpose of dealing in lubricating greases and operating a factory.

The Indiana group has been engaged in such an enterprise for the past year. Officials of the new corporation announced that the present Indiana plant will have its capacity of 1,000,000 gallons more than tripled.

Distribution will be handled through the farm bureaus in the three states involved, with county units of the bureau passing the products on to the consumer.

A. P. I. Aide Weds A. E. F. O. Officer

NEW YORK, Nov. 8.—Miss Eloise M. Michel who has been a member of the staff of the American Petroleum Institute since the A.P.I. was organized in 1919, was married today to Major Idus R. McLendon, U. S. Field Artillery, retired, in the chapel of the U. S. Military Academy at West Point. Chaplain Arthur B. Kinsolving performed the ceremony. Major McLendon fired the first shot for the A.E.F. in the World War, a French 75 which is now mounted at West Point. Miss Michel was secretary to the late Robert Welch and later has been with the A.P.I. public relations department.

PHILADELPHIA—E. F. Houghton & Co. has announced a new line of lubricants for heavy, slow moving, open gears. The new products were designed to resist being thrown off of gears while in motion and to retain lubricating qualities at low temperatures. The new lubricants have been named Tenac and are offered in four grades.

Shipments From Southern California

LOS ANGELES, Nov. 6.—Shipment of bulk petroleum from Southern California ports to Foreign and Atlantic Seaboard ports for week ended Nov. 1 totaled 1,002,041 barrels as compared with 973,035 barrels to these same ports for the previous week. Destination and quantity of shipments were as follows:

Destination	Crude	Gasoline	Diesel	Kerosine	Gas-Oil	Fuel	Total
Pacific For.	92,672	.....	33,154	.....	.....	185,922	311,748
Atlantic Dom.	.....	240,476	117,188	.....	64,687	.....	422,351
Atlantic For.	.....	228,942	.....	59,000	.....	.....	287,942

Prices 10 Years Ago
Nov. 8, 1920

	Oklahoma	Penna.
58-60 U. S. Motor	19.50-20.00c	24.00-24.50c
80-84 Natural	20.00-21.00c	.....
Kerosine (42-43 Okla.; 47 w. w. Pa.)	8.25-8.75c	14.00-15.00c
Fuel Oil (24-26 Okla.; 36-40 Pa.)	$1.90-$2.00	9.75-10.25c
Crude (Okla. 35-35.9)	$3.50	$6.10
Chicago tank wagon (no state tax)		27.00c

Prices A Year Ago
Nov. 11, 1929

	Oklahoma	Penna.
58-60 U. S. Motor	7.4250c	8.25-9.00c
Grade A Natural	6.625-6.75c	.....
Kerosine (Okla. 41-43; Pa. 47 w. w.)	4.50-5.00c	7.375-8.00c
Fuel Oil (Okla. 24-26; Pa. 36-40)	$0.875-$0.95	5.125-5.25c
Crude (Okla. 35-35.9)	$1.40	$3.05
Chicago tank wagon (including 3c tax)		17.00c

Mid-Continent Refinery Markets

Gasoline Markets More Stable

Staff Special
TULSA, Nov. 8

MID-CONTINENT gasoline markets were more stable the first week of November. The effects of the general crude reductions gradually wore off and in three districts the low quotations for gasoline were advanced slightly late in the week.

Even in the face of the statement, however, that prices were more stable, it cannot be said that markets have developed any signs which would indicate a definite trend toward improvement. The price wars throughout the middle west, with the resultant uncertainty with reference to the tank wagon and service station price structure, continued to have a depressing effect on the market generally.

Refiners have the gasoline in abundance and jobbers do not want any gasoline in their storage tanks, at least no more than bare working stocks. The result has been the gradual but definite development of a buyer's market. It has been a long time now since the jobber asked the refiner how much gasoline he could spare him. The refiner asks the jobber how many cars can he use, what he's willing to pay, and can he furnish immediate instructions. And there the situation rests, with the average refiner still operating pretty much in the red, with the present crude schedule and refined oils price structure.

Oklahoma refiners for the most part reported more instructions received during the week, and in one or two instances sufficient orders were received to permit the seller to raise his quotation slightly. That reduced the price range somewhat but there still was an unusually wide spread in quotations, particularly for the 58-60, U. S. Motor and 58-60, 437 e.p. grades.

The North Texas refiners, as was to be expected, did considerable business in the southeast, moving in on the Louisiana and Arkansas refiners when their differential market quotations remained almost a cent above the f.o.b. plant quotations of the north Texas refiners. This situation, and the slight stiffening in the Oklahoma and West Texas markets gave some support to the North Texas refiners and the low side of the range was boosted 0.125 cent.

The Louisiana and Arkansas refiners reported, however, that their gasoline stocks were in such shape that they did not feel the North Texas invasion so keenly that they had to meet the competition. Another factor probably was that of the numerous contracts in that territory, several refiners having based them on the North Texas quotations.

The withdrawal of quotations for gasoline and kerosine for export at Gulf terminals by the Export Petroleum Association Inc., apparently will have little direct effect in the Mid-Continent. Members of the association have been inactive for some time, and independent buyers have been obtaining all their requirements at prices considerably under those of the association.

The only direct effect probably will be on a few small contracts one or two buyers have with a few North Texas refiners. The contracts were based on the prices quoted at the Gulf. Competitive prices probably will lower the netback to the refiners, but the amount on contract, as far as could be learned, was almost negligible

Little can be written about the kerosine market as far as the majority of Mid-Continent districts were concerned. Prices were steady throughout the week but demand was exceedingly light. The Louisiana and Arkansas refiners apparently were the only ones who enjoyed a good business. One large company in that district stopped making kerosine some time ago, and the result has been a growing scarcity of the oil, with a comparatively steady demand.

Demand for stove distillates slowed up somewhat but prices were unchanged in all districts. The first cold snap two or three weeks ago caused a rush business for a few days, but with milder weather the demand dropped noticeably. The same was true of zero cold test gas oil, although the scarcity of the latter oil was such that prices remained unchanged.

The ordinary grades of gas oil were more freely offered in several quarters.

High gravity, low cold test fuel oils continued to be in good demand. The other grades were free at unchanged prices.

No changes were noted in neutral oil prices but bright stock prices were fractionally lower in several quarters. Competition was keen for what business existed.

Wax was sluggish. Demand was considerably lighter than it was at this period a year ago, several refiners indicated.

Natural gasolines showed a tendency to advance slightly late in the week. Steady buying caused at least a temporary scarcity of grades A and AA, particularly where the commodity would take a 20.5-cent export rate to the Gulf, and quotations were 0.125 cent higher Nov. 8 than they had been previously the past week.

A.A.A. Warns Against Higher Gas Taxes

WASHINGTON, Nov. 1—Recalling the fact that the legislatures in 22 states increased the gasoline tax in 1929, the American Automobile Association, through Thomas P. Henry, its president, in anticipation of the meeting of the legislatures in 44 states early next year, has protested against increases and the tendency to divert the gasoline tax money to purposes other than road building.

A proposal before New Jersey, to be voted upon on Nov. 4, to float two bond issues for purposes having no connection with highways and the retirement of those bonds by the use of gasoline taxes, Mr. Henry pointed out as illustrative of the tendency to use the gasoline tax for general purposes.

"As if it were not enough that the gas tax in some states should be diverted to schools, sea walls and fish hatcheries," he observed, "New Jersey now comes along with a proposal to saddle the expense of state institutions and inland waterways, in an amount of $17,000,000 upon the users of highways. The New Jersey voters have a perfect right to tax themselves as they see fit, but if the proposal is successful and the precedent is followed by other states, it will ultimately prove the undoing of the gas tax.

"Because of the ease with which it is levied and collected, there undoubtedly exists a temptation to keep raising the tax out of proportion to road-building, to which, of course, it should be at all times related."

F. D. Williams Retires From Nat'l Transit

OIL CITY, Nov. 8.—F. D. Williams, president and general manager of National Transit Co. and subsidiaries since 1920, has retired after 54 years' service in the oil industry. He has been succeeded by L. E. Lockwood.

Mr. Lockwood was president of Crescent Pipe Line Co. which was dissolved several years ago. He has been a director of National Transit Co. for about two years.

Comparative Prices of 58-60 U. S. Motor Gasoline, 437 E. P., Group 3 and Point of Origin, to Jobbers Only

In Effect November 10

	Price F.O.B. Group 3		*Price F.O.B. Point of Origin*		*If for Particular Destination*
Oklahoma	4.875–5.375	(See note)	4.875–5.375	(See note)	
**Oklahoma	4.75 –5.375		4.75 -5.375		
Kansas	5.00 –5.50				S. O. Neb. & Indiana Territory, etc.
Kansas			5.5800	(Wt. Avg.)	Kansas only.
North Texas	4.75		4.75		
West Texas	4.625–4.75		4.625–4.75		
Louisiana-Arkansas	5.00 –5.50				Michigan, Ohio and Indiana.
Louisiana-Arkansas			5.75		State or differential haul.
Indiana-Illinois	4.625–5.00		*		S. O. Indiana territory except Detroit and vicinity. For Ohio on delivered basis only.

*Shipments made from E. Chicago, Ind., and Wood River, Ill., according to conditions and freight rates; no prices F.O.B. point of origin can be given.

**Price of this 58-60, 437 e.p. gasoline, which in most instances meets full U. S. Motor gasoline specifications, represents quotations and sales prices of four refiners having 7% of the refining capacity of Oklahoma. These four refiners are not reporting their prices for use in compiling weighted averages on U. S. Motor gasoline.

Note: No sales reported for the gasoline marked "see note" on the dates so marked; prices shown on such dates represent majority of quotations only.

Chicago Resale Market

CHICAGO, Nov. 8

BETTER demand was reported for gasoline in the Chicago resale market last week, especially during the first few days, and spot prices generally moved higher. Most sales of U. S. Motor were at a low of 4.625 cents over the week, against 4.50 cents on Nov. 3. Several marketers said they were now moving Oklahoma gasoline into a number of Michigan points for the first time in a long while. A price of 4.50 to 4.625 cents was reported low enough to get business in that state at present, except at points with a relatively high freight rate from the Group.

Following prices represent majority of sales made on Group 3 freight basis, although shipments may originate in other refining districts, such as North and West Texas, Arkansas, Louisiana, Indiana, Illinois, Kentucky, etc.

	Prices Nov. 10	Prices Nov. 3	Prices Oct. 27
58-60 U. S. Motor, 437 e.p.	4.625– 5.00	4.50 – 5.125	4.75 – 5.25
†56-62 400-437 e.p. anti-knock gasoline	5.375– 6.50	5.50 – 6.75	6.00 – 7.00
60-62 437 e.p. gasoline	4.75 – 5.125	4.625– 5.125	4.875– 5.375
60-62 400 e.p. gasoline	5.00 – 5.375	5.00 – 5.50	5.125– 5.625
64-66 375 e.p. gasoline	5.625– 6.00	5.625– 6.125	5.625– 6.125
68-70 350-360 e.p. gasoline	6.25 – 6.50	6.50 – 6.75	6.50 – 6.75
*Domestic Aviation Gasoline	7.50 – 7.75	8.00 – 8.25	8.00 – 8.25
41-43 w.w. kerosine	3.00 – 3.375	3.00 – 3.375	3.00 – 3.375
42-44 w.w. kerosine	3.25 – 3.75	3.25 – 3.75	3.375– 3.75
38-40 straw distillate	2.875– 3.00	2.875– 3.00	2.875– 3.00
32-36 ordinary dark gas oil	2.25 – 2.375	2.25 – 2.375	2.25 – 2.375
32-36 dark zero gas oil	2.625– 2.75	2.625– 2.75	2.625– 2.75
32-36 straw zero gas oil	2.75 – 2.875	2.75 – 2.875	2.75 – 2.875
28-30 zero fuel oil (per bbl.)	$0.85 –$0.90	$0.85 –$0.90	$0.85 –$0.90
28-30 fuel oil (per bbl.)	$0.80 –$0.85	$0.80 –$0.85	$0.80 –$0.85
24-26 fuel oil (per bbl.)	$0.60 –$0.65	$0.60 –$0.65	$0.60 –$0.65
18-22 fuel oil, low sulfur (per bbl.)	$0.50 –$0.55	$0.50 –$0.55	$0.50 –$0.55
18-22 fuel oil, high sulfur zero (per bbl.)	$0.525–$0.575	$0.525–$0.575	$0.525–$0.575
14-16 fuel oil (per bbl.)	$0.425–$0.475	$0.425–$0.475	$0.425–$0.475

*Prices are based on U. S. Gov't. specifications or better. Present Gov't. specifications require distillation range of 5% recovery at not more than 167° F., and not less than 122° F.; 50% recovery at 221°; 90% at 311°; 96% at 347°; end point 374° F. Gasoline of fighting grade specifications in some instances sells at a premium over domestic aviation grade. Prices represent majority of quotations.

†Over 45% benzol equivalent. Prices represent quotations and sales.

Weighted Average Prices

OKLAHOMA

	Nov. 10 No. of Cars	Price	Nov. 3 No. of Cars	Price	Oct. 27 No. of Cars	Price
58-60 U. S. Motor, 437 e.p.	..	4.875–5.375 (See note)	..	4.75–5.375 (See note)	4	5.0000
*58-60 437 e.p. gasoline	..	4.75 –5.375	..	4.625–5.375	..	4.75–5.50
60-62 437 e.p. gasoline	..	5.00 –5.50 (See note)	2	4.8750	6	5.5000
60-62 400 e.p. gasoline	..	5.50 –5.75 (See note)	..	5.75–6.25 (See note)	..	5.75–6.25 (See note)
64-66 375 e.p. gasoline	..	5.75 –6.25 (See note)	..	6.50 (See note)	..	6.50–6.75 (See note)

KANSAS

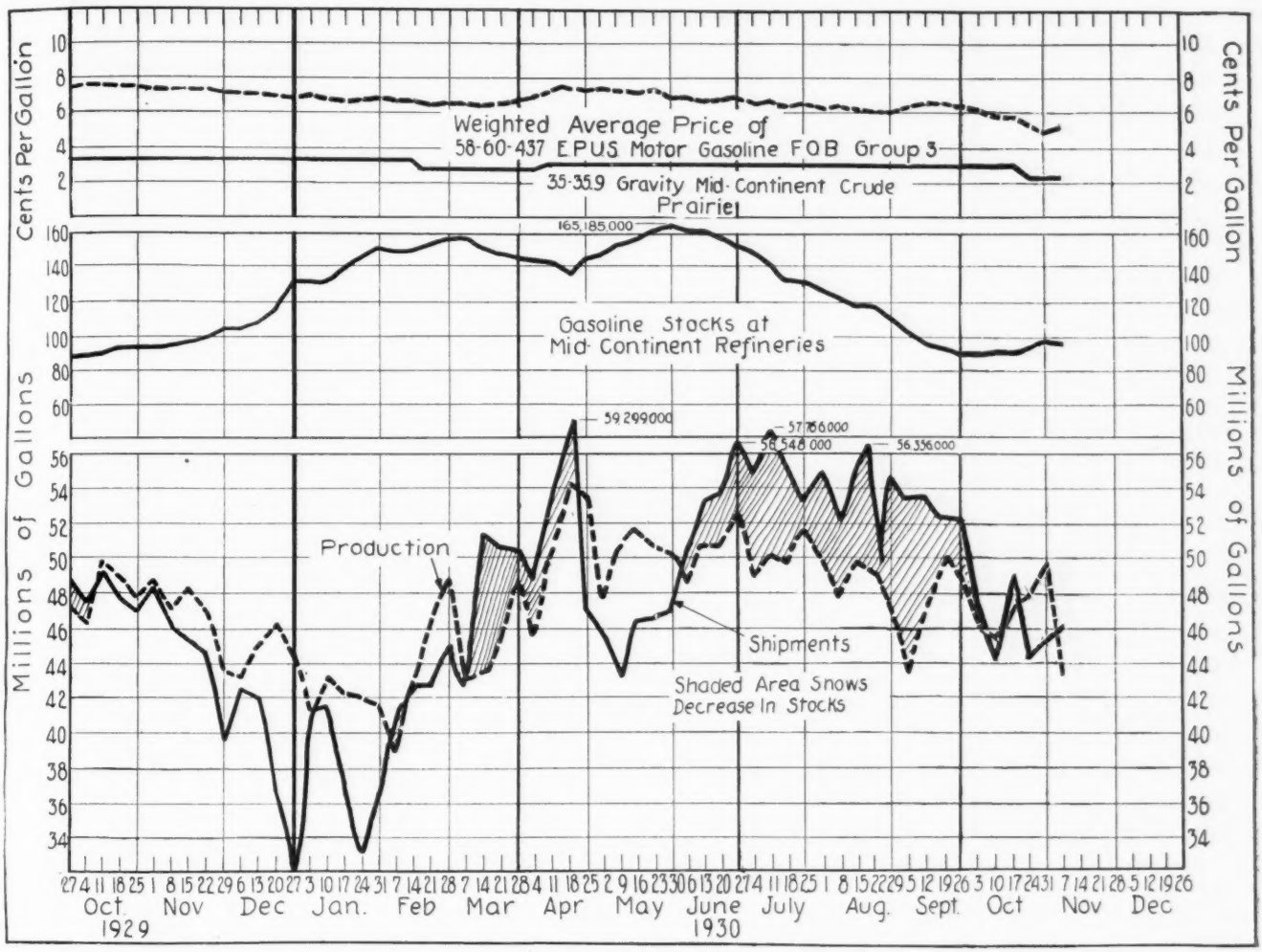
	Nov. 10 No. of cars	Price	Nov. 3 No. of cars	Price	Oct. 27 No. of Cars	Price
58-60 U. S. Motor, 437 e.p.	10	5.5800	7	5.6287	9	5.8889

Note: No sales reported for the gasoline marked "see note" on the dates so marked; prices shown on such dates represent majority of quotations only.

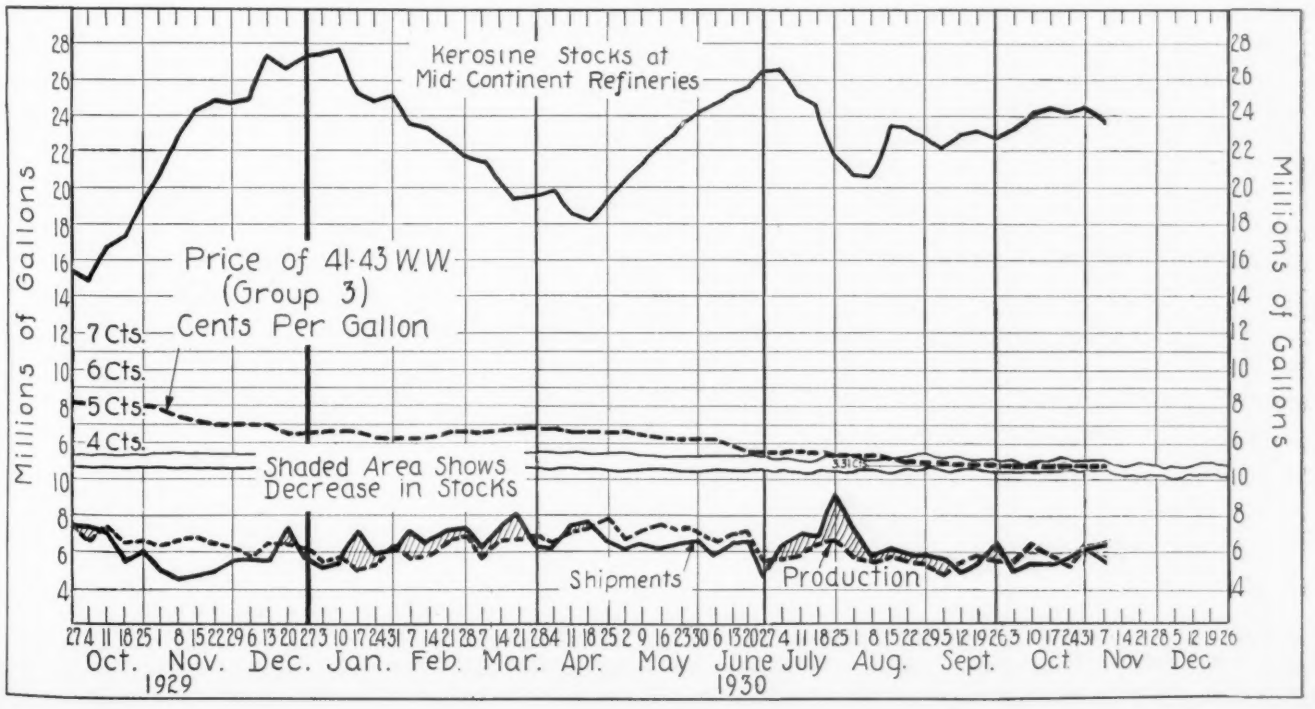
*Price of this 58-60, 437 e. p. gasoline, which in most instances meets full U. S. Motor gasoline specifications, represents quotations and sales prices of four refiners having 7% of the refining capacity of Oklahoma. These four refiners are not reporting their prices for use in compiling weighted averages on U. S. Motor gasoline.

Barometer of Mid-Continent Refinery Market—Week Ending November 7

Charted Course of Prices, Production, Shipments, Stocks of Principal Refined Products, Week by Week, From Reports Made by 93 Plants to National Petroleum News



Prices shown above are extended to date shown in Refinery Market and Crude tables in Market section of this issue and stocks, shipments and Production are extended to date as shown in the table on page 274



Refinery Markets on Light Oils and Lubricants

Prices given below are in cents per gallon, except where $ is shown. They represent prices made only to domestic jobbers who resell to the consuming public, except where otherwise noted.

(These Refinery Prices compiled in the OIL PRICE HANDBOOK for a whole year)

GASOLINE AND NAPHTHA

OKLAHOMA (F. o. b. Oklahoma refineries)

	Prices Nov. 10	Prices Nov. 3	Prices Oct. 27
58-50 450 e.p. naphtha...	4.875– 5.00	4.875– 5.00	5.00 – 5.25
40-52 450 e.p. naphtha...	4.875– 5.00	4.875– 5.00	5.00 – 5.25
56-58 450 e.p. gasoline...	4.875– 5.00	4.875– 5.00	5.00 – 5.25
58-60 450 e.p. gasoline...	4.875– 5.00	4.875– 5.00	5.00 – 5.25
64-66 390 e.p. gasoline...	6.25 – 6.50	6.25 – 6.50	6.375– 6.50
68-70 350-360 e.p. gasoline	6.50 – 6.75	6.50 – 6.75	7.00
‡Domestic Aviation Gasoline.....	7.00 – 8.00	7.00 – 8.00	7.00 – 8.00

‡Prices based on U. S. Gov't. specifications or better. Present Gov't. specifications require distillation range of 5% recovery at not more than 167°F., and not less than 122° F.; 50% rec. at 221°; 90% at 311°; 96% at 347°; end point, 374°F. Fighting grade in some instances sells at a premium over domestic aviation grade. Prices represent majority of quotations.

PENNSYLVANIA (F. o. b. Western Pennsylvania refineries)

52-54 Naphtha.....	6.00 – 6.50	6.50 – 7.00	6.50 – 7.00
54-56 Naphtha.....	6.25 – 7.00	6.50 – 7.00	6.50 – 7.00
58-60 U.S. Motor 437 e.p.	6.50 – 6.75	6.50 – 7.00	6.75 – 7.00
60-62 400-410 e.p. gasoline	6.75 – 7.25	7.00 – 7.25	7.00 – 7.25
64-66 390 e.p. gasoline....	7.25 – 7.75	7.25 – 7.75	7.50 – 7.75
68-70 350-360 e.p.....	8.00 – 8.75	8.25 – 8.75	8.25 – 8.75

OHIO (Quotations of S. O. Ohio. 4c state tax to be added.)

U. S. Motor Gasoline			
Ohio, delivery at any point.....	9.00	9.00	9.00

KANSAS (F. o. b. refinery Kansas destination)

60-62 437 e.p. gasoline....	6.00 – 6.25	6.00 – 6.25	6.25 – 6.50
60-62 400 e.p. gasoline....	6.25 – 6.50	6.25 – 6.50	6.50 – 6.75
64-66 375 e.p. gasoline....	6.75 – 7.00	6.75 – 7.00	7.00 – 7.25

NORTH TEXAS (F. o. b. North Texas refineries)

56-58 450 e.p. gasoline....	4.50	4.50	4.75
58-60 450 e.p. gasoline....	4.50	4.50	4.75
58-60 U.S. Motor 437 e.p.	4.75	4.50 – 4.75	4.75 – 5.00
60-62 400 e.p. gasoline....	5.00 – 5.25	5.00 – 5.25	5.125– 5.375
64-66 390 e.p. gasoline....	5.25 – 5.50	5.25 – 5.50	5.50 – 5.75
64-66 375 e.p. gasoline....	5.50 – 5.75	5.50 – 5.75	5.75 – 6.25
68-70 350-360 e.p. gasoline	6.25 – 6.50	6.25 – 6.50	6.50 – 6.75

****WEST TEXAS** (F. o. b. West Texas refinery, for unrestricted shipment)

50-52 naphtha.....	4.50	4.50	4.75
58-60 437 e.p. gasoline....	4.50	4.50	4.75
58-60 U.S. Motor 437 e.p. gasoline.....	4.625– 4.75	4.625	4.75 – 5.00

NORTH LOUISIANA (N. La., Ark. and Miss. destination)

58-60 U.S. Motor 437 e.p	5.75	5.75	5.75

ARKANSAS (Ark., N. La. and Miss. destination)

58-60 U.S. Motor 437 e.p.	5.75	5.75	5.75

CALIFORNIA (3c tax to be added to California gasoline prices if used in state.)

54-58 U.S. Motor 437 e.p.	9.50 –11.50	8.75 –12.50	9.25 –12.50
54-58 U.S. Motor, for outside state shipment....	7.50 – 9.00	7.50 – 9.00	7.50 – 9.00
58-61 375-400 e.p. gasoline	11.50 –12.50	11.00 –13.50	11.00 –13.50
42-45 Engine Distillate 445-480 e.p.....	8.50 –10.00	8.50 –10.00	8.75 –10.00

NATURAL GASOLINE

(Note: End point of all grades, not over 375F. Corrosion test adopted Oct. 1, 1927; A.S.T.M. Method D130-27T; doctor test, July 2, 1928.)

OKLAHOMA (F. o. b. Oklahoma refineries)

Grade AA, 80-87.9, 90% Recovery.....	4.50	4.50	4.75
Grade A, 72-79.9, 90% Recovery.....	4.50–4.75	4.50	4.75
Grade BB, 84-92, 85% Recovery.....	4.50	4.50	4.75
Grade B, 76-83.9, 85% Recovery.....	4.50	4.50	4.75
Grade C, 80-92, 78% Recovery.....	4.50	4.50	4.75

NORTH TEXAS (F. o. b. Breckenridge)

Grade AA, 80-87.9, 90% Recovery.....	4.50–4.625	4.50	4.75
Grade A, 72-79.9, 90% Recovery.....	4.50–4.75	4.50	4.75
Grade BB, 84-92, 85% Recovery.....	4.50	4.50	4.75
Grade B, 76-83.9, 85% Recovery.....	4.50	4.50	4.75
Grade C, 80-92, 78% Recovery.....	4.50	4.50	4.75

NORTH LOUISIANA (F. o. b. Monroe District)

	Prices Nov. 10	Prices Nov. 3	Prices Oct. 27
Grade AA.....	†4.75	†4.75	†5.00
Grade BB.....	†4.75	†4.75	†5.00
Grade C.....	†4.75	†4.75	†5.00

CALIFORNIA (F. o. b. California refineries)

75-85, 375-390 e.p. for blending.....	6.50 – 7.25	7.00 – 8.00	7.50 – 8.50

BURNING OILS

PENNSYLVANIA (F. o. b. Western Pennsylvania refineries)

45 w. w. kerosine.....	4.625– 5.00	4.75 – 5.00	4.75 – 5.00
46 w.w. kerosine.....	5.00 – 5.50	5.00 – 5.50	5.125– 5.50
47 w. w. kerosine.....	5.25 – 5.75	5.375– 5.75	5.375– 5.75
300 mineral seal.....	5.50 – 6.00	5.50 – 6.00	5.50 – 6.00

OKLAHOMA (F. o. b. Oklahoma refineries)

41-43 w. w. kerosine.....	3.125– 3.50	3.125– 3.50	3.125– 3.50
42-44 w. w. kerosine.....	3.50 – 4.00	3.50 – 4.00	3.50 – 4.00

KANSAS (F. o. b. refinery Kansas destination)

41-43 w. w. kerosine.....	3.75 – 4.00	3.75 – 4.00	4.00 – 4.25
42-44 w. w. kerosine.....	4.50 – 4.75	4.50 – 4.75	4.75

NORTH TEXAS (F. o. b. North Texas refineries)

40-42 w. w. kerosine.....	3.00	3.00	3.00
41-43 w. w. kerosine.....	3.00 – 3.25	3.00 – 3.25	3.00 – 3.25

NORTH LOUISIANA (N. La., Ark. and Miss. destination)

41-43 w. w. kerosine.....	4.00	4.00	4.00
42-44 w. w. kerosine.....	4.25	4.25	4.25

ARKANSAS (Ark., N. La. and Miss. destination)

41-43 w. w. kerosine.....	4.00	4.00	4.00

CALIFORNIA (F. o. b. California refineries)

38-40 w. w. kerosine.....	5.00 – 6.00	5.25 – 6.00	5.25 – 6.00

NEUTRAL OIL

PENNSYLVANIA (F. o. b. Western Pennsylvania refineries)

Vis.		(Viscosity at 70° F.)	
200 No. 3 Assoc. Filt.....	16.75 –19.00	17.25 –19.00	17.25 –19.00
180 No. 3 Assoc. Filt.....	14.00 –16.00	14.00 –16.00	15.50 –16.00
150 No. 3 Assoc. Filt.....	10.75 –12.00	11.00 –12.00	11.00 –12.00
		(Non Viscous)	
34 Grav. 330-340 Flash...	5.50 – 6.50	5.50 – 6.50	5.50 – 6.50

****MID-CONTINENT** (F. o. b. Mid-Continent refineries)

Vis. Color		(Viscosity at 100° F.)	
100—No. 2.....	5.50 – 6.00	5.50 – 6.00	5.50 – 6.00
150—No. 3.....	7.50	7.50	7.50
150—No. 4.....	7.00	7.00	7.00
180—No. 3.....	8.00 – 9.00	8.00 – 9.00	8.00 – 9.00
180—No. 4.....	8.50	8.50	8.50
180—No. 5.....	8.00	8.00	8.00
200—No. 3.....	9.75 –10.50	9.75 –10.50	9.75 –10.50
200—No. 4.....	10.00	10.00	10.00
200—No. 5.....	8.75 – 9.25	8.75 – 9.25	8.75 – 9.25
220—No. 3.....	12.50	12.50	12.50
220—No. 4.....	12.00	12.00	12.00
220—No. 5.....	11.00	11.00	11.00
240—No. 3.....	13.50 –14.00	13.50 –14.00	13.50 –14.00
240—No. 4.....	12.50 –13.00	12.50 –13.00	12.50 –13.00
240—No. 5.....	12.00	12.00	12.00
280—No. 3.....	16.00	16.00	16.00
280—No. 4.....	15.00	15.00	15.00
280—No. 5.....	14.00	14.00	14.00

†Prices nominal ††Only one refiner quoting *Quotations only

****Represents Both Sales and Quotations.**

Refinery Markets Wax, Lubricants, Heavy Oil

Prices given below are in cents per gallon, except where $ is shown. They represent prices made only to domestic jobbers who resell to the consuming public, except where otherwise noted.

(For quick reference to Refinery Prices, get the OIL PRICE HANDBOOK, published annually)

GULF COASTAL (F. o. b. Gulf Coastal refineries)

Vis. Color	Prices Nov. 10	Prices Nov. 3	Prices Oct. 27
	(Viscosity at 100° F., pour test 0)		
100—No. 2 Pale	6.00 – 6.25	5.50 – 6.00	6.00 – 6.50
200—No. 3 Pale	8.00 – 8.50	8.00 – 8.50	8.50 – 9.00
300—No. 3 Pale	9.25 – 9.75	9.25 – 9.75	9.75 –10.25
500—No. 3½ Pale	10.50 –11.00	10.50 –11.00	11.00 –11.50
750—No. 4 Pale	12.00 –12.50	12.00 –12.50	12.50 –13.00
1200—No. 4 Pale	14.50 –15.00	14.50 –15.00	15.00 –15.50
2000—No. 4-5 Pale	15.50 –16.00	15.50 –16.00	16.00 –16.50
200—No. 5½ Red Oil	7.25 – 7.75	7.25 – 7.75	7.75 – 8.25
300—No. 5½ Red Oil	8.50 – 9.00	8.50 – 9.00	9.00 – 9.50
500—No. 6 Red Oil	9.75 –10.25	9.75 –10.25	10.25 –10.75
750—No. 6 Red Oil	11.25 –11.75	11.25 –11.75	11.75 –12.25
1200—No. 5-6 Red Oil	13.50 –14.00	13.50 –14.00	14.00 –14.50
2000—No. 6 Plus Red Oil	15.50 –16.00	15.50 –16.00	16.00 –16.50

‡CALIFORNIA (F. o. b. California refineries)

Vis. Color	(Viscosity at 100° F.)		
100—No. 3	9.50 –10.00	9.50 –10.00	9.50 –10.00
200—No. 3	11.50	11.50	11.50
300—No. 3	13.00	13.00	13.00
450—No. 3	15.50	15.50	15.50
550—No. 3	16.50	16.50	16.50
600—No. 3	17.00	17.00	17.00
200—No. 5	11.00	11.00	11.00
300—No. 5	12.00	12.00	12.00
400—No. 5	14.00	14.00	14.00
500—No. 5	15.00	15.00	15.00
600—No. 5	16.00	16.00	16.00
700—No. 7	18.00	18.00	18.00

‡Neutral oils not manufactured commercially in California.

CYLINDER STOCKS

MID-CONTINENT (F. o. b. Mid-Continent refineries)

(Bright stock prices represent quotations to domestic jobbers only).

190-200 Vis. D at 210° Brt St.	28.00 –30.00	28.00 –30.00	28.00 –30.00
150-160 Vis. D at 210° Brt. St., 0-10 cold test	21.00 –23.00	21.00 –23.00	21.00 –23.00
150-160 Vis. D at 210° Brt. St., 10-25 cold test	19.00 –21.00	20.00 –21.00	20.00 –21.00
150-160 Vis. D Brt. Stock, 25-40 cold test	18.00 –19.00	19.00 –20.00	19.00 –20.00
150-160 Vis. E 210° Brt. St.	17.00 –18.00	18.00 –20.00	18.00 –20.00
600 St. Ref. Olive Green	8.00	8.00	8.00
600 St. Ref. Dark Green	8.00	8.00	8.00
Black Oil	5.00	5.00	5.00

PENNSYLVANIA (F. o. b. Western Penna. refineries) (A.S.T.M. Tests)

600 Steam Refined, filterable	9.50 –10.00	†9.50 –11.00	10.00 –11.00
650 Steam Refined	14.00 –16.00	14.50 –16.00	15.00 –16.00
600 Flash	16.50 –18.00	16.50 –19.00	16.50 –19.00
630 Flash	24.00 –26.00	24.00 –28.00	24.00 –28.00
600 Warren E	15.50 –17.00	15.50 –17.00	15.50 –17.00
600 Oil City E	15.00 –16.00	15.00 –16.50	15.00 –16.50
600 D Filtered	18.50 –19.50	18.50 –19.50	18.50 –19.50
Cold Test Stock, 140-150 vis. at 210°, 540-550 flash, No. 8 color, below 35 pour test	21.00 –23.50	22.00 –23.50	22.00 –23.00
No. 8 color, above 35 pour test	18.50 –20.00	19.00 –20.00	19.00 –20.00
No. 6-6½ color diluted, 40-50 pour test	†17.50 –21.00	†18.50 –21.00	†18.50 –21.00

WAX

PENNSYLVANIA (Per pound, F. o. b. New York)

122-124 white crude scale a.m.p.	2.125– 2.25	2.125– 2.25	2.15 – 2.25
124-126 white crude scale, a.m.p.	2.125– 2.25	2.125– 2.25	2.25

****OKLAHOMA** (Per pound in barrels; in a few instances, per pound in burlap bags; F. o. b. Oklahoma refineries.)

124-126 White Crude Scale, a.m.p.	2.125– 2.25	2.25	2.25

DISTILLATE, GAS AND FUEL OIL

PENNSYLVANIA (For outside Pittsburgh district)

36-40 fuel oil	3.625– 3.875	3.75 – 4.00	3.75 – 4.00
30-34 fuel oil	3.625– 3.75	3.75 – 4.00	3.75 – 4.00
28-32 fuel oil	3.625– 3.75	3.75 – 4.00	3.75 – 4.00

†Prices nominal ††Only one refiner quoting *Quotations only

OKLAHOMA (F. o. b. Oklahoma refineries)

	Prices Nov. 10	Prices Nov. 3	Prices Oct. 27
38-40 straw distillate	3.00 – 3.125	3.00 – 3.125	3.00 – 3.125
36-38 straw distillate	2.875– 3.00	2.875– 3.00	2.875– 3.00
32-36 straw gas oil	2.50 – 2.625	2.50 – 2.625	2.50 – 2.625
32-36 straw gas oil zero	2.75 – 2.875	2.75 – 2.875	2.75 – 2.875
32-36 dark gas oil	2.125– 2.375	2.125– 2.375	2.375– 2.50
32-36 dark gas oil zero	2.625– 2.875	2.625– 2.875	2.75 – 2.875
28-30 zero fuel oil(per bbl.)	$0.85 – 0.95	$0.85 – 0.95	$0.85 – 0.90
28-30 fuel oil (per bbl.)	$0.80 – 0.825	$0.80 – 0.825	$0.80 – 0.825
26-28 fuel oil (per bbl.)	$0.70 – 0.75	$0.70 – 0.75	$0.70 – 0.75
24-26 fuel oil (per bbl.)	$0.65 – 0.70	$0.65 – 0.70	$0.60 – 0.65
22-26 fuel oil (per bbl.)	$0.55 – 0.60	$0.55 – 0.60	$0.575– 0.60
18-22 fuel oil (per bbl.)	$0.475– 0.525	$0.475– 0.525	$0.475– 0.525
16-20 fuel oil (per bbl.)	$0.425– 0.475	$0.425– 0.475	$0.425– 0.475
14-16 fuel oil (per bbl.)	$0.40 – 0.45	$0.40 – 0.45	$0.40 – 0.45

KANSAS (F. o. b. refinery Kansas destination)

38-40 straw distillate	3.25 – 3.50	3.25 – 3.50	3.25 – 3.50
36-38 straw distillate	3.00	3.00	3.00
32-36 straw gas oil	3.00	3.00	3.00
18-22 fuel oil (per bbl.)	$0.70 – 0.75	$0.70 – 0.75	$0.70 – 0.75
10-14 fuel oil (per bbl.)	$0.55 – 0.65	$0.55 – 0.65	$0.55 – 0.65

NORTH TEXAS (F. o. b. North Texas refineries)

38-40 straw distillate	3.00	3.00	2.75 – 3.00
38-40 p.w.treated distillate	3.125– 3.25	3.125– 3.25	3.125– 3.25
32-36 gas oil, cracked	2.25 – 2.50	2.25 – 2.50	2.50 – 2.265
32-36 St. reduced gas oil	2.125– 2.375	2.125– 2.375	2.375– 2.50
24-26 fuel oil (per bbl.)	$0.50 –$0.55	$0.50 –$0.55	$0.50 –$0.55
20-24 fuel oil (per bbl.)	$0.45 –$0.50	$0.45 –$0.50	$0.45 –$0.50
18-22 fuel oil (per bbl.)	$0.40 –$0.45	$0.40 –$0.45	$0.40 –$0.45

****WEST TEXAS** (F. o. b. West Texas refinery, or unrestricted shipment)

34-38 gas oil	2.25 – 2.50	2.25 – 2.50	2.25 – 2.50
30-32 gas oil	1.875– 2.125	1.875– 2.125	1.875– 2.125
28-30 zero gas oil	2.25 – 2.50	2.25 – 2.50	2.25 – 2.50
18-22 fuel oil (per bbl.)	$0.50 –$0.60	$0.50 –$0.60	$0.50 –$0.60

NORTH LOUISIANA (N. La., Ark. and Miss. destination)

32-36 gas oil, dark	*3.25	*3.25	*3.25
32-36 gas oil, straw	*3.25	*3.25	*3.25
14-16 fuel oil (per bbl.)	$0.75 –$0.85	$0.75 –$0.85	$0.75 –$0.85

ARKANSAS (Ark., N. La. and Miss. destination)

32-36 gas oil, straw	3.25	3.25	3.25
32-36 dark gas oil	3.25	3.25	3.25
28-30 gas oil	3.00	3.00	3.00
20-24 fuel oil (per bbl.)	$0.90 –$0.95	$0.90 –$0.95	$0.90 –$0.95
9-12 fuel oil (per bbl.)	$0.70 –$0.75	$0.70 –$0.75	$0.70 –$0.75
Black oil	3.25	3.25	3.25

CALIFORNIA (F. o. b. San Joaquin Valley. Nominal pipe line charge to San Francisco 24c per bbl. more and to San Pedro 20c per bbl. more.)

14-18 fuel oil (per bbl.)	$0.35 –$0.60	$0.45 –$0.60	$0.50 –$0.65
14-18 Bunker oil (per bbl.)	$0.65 –$0.85	$0.70 –$0.85	$0.70 –$0.85
30-34 gas oil (per bbl.)	$0.85 –$1.05	$0.85 –$1.05	$0.90 –$1.00
27 Plus Diesel oil (per bbl.)	$0.85 –$1.05	$0.85 –$1.05	$0.85 –$1.00

PETROLATUMS

PENNSYLVANIA (Per pound, in barrels, carload lots, f. o. b. refinery. In tank cars 5/8c to 3/4c per pound less.) Two refiners quoting.

Snow White	8.50	8.50	8.50
Lily White	7.50	7.50	7.50
Cream White	6.50	6.50	6.50
Light Amber	3.375– 3.625	3.375– 3.625	3.375– 3.625
Amber	3.125– 3.375	3.125– 3.375	3.125– 3.375
Red	2.875– 3.00	2.875– 3.00	2.875– 3.00

PETROLEUM COKE

****OKLAHOMA** (F. o. b. Oklahoma refineries)

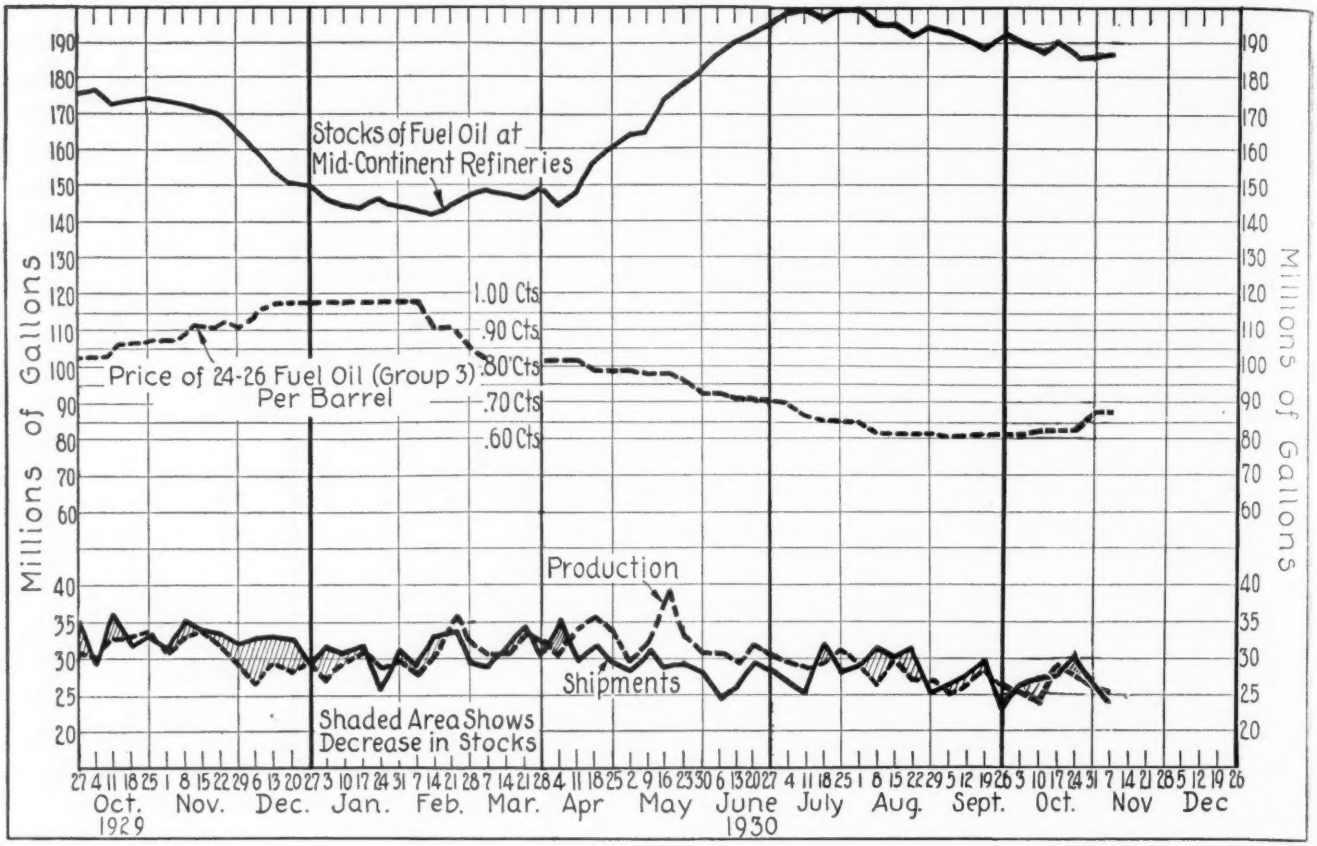
(Per ton in car lots)

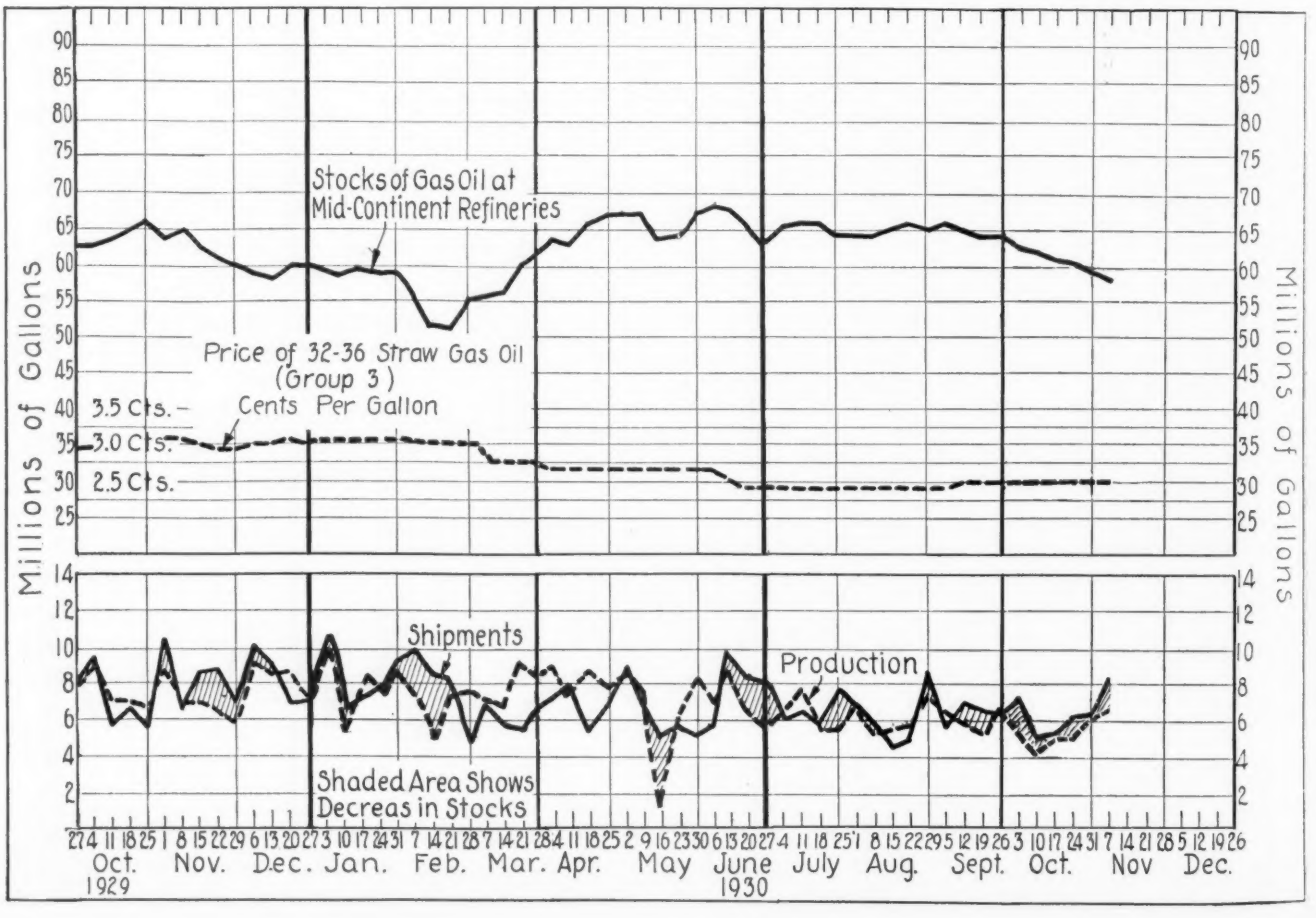
Lump	$4.50 –$5.00	$4.50 –$5.00	$4.50 –$5.00
Still run	$3.00	$3.00	$3.00
Breeze	$2.00	$2.00	$2.00

****Represents Both Sales and Quotations.**

Barometer of Mid-Continent Refinery Market—Week Ending November 7

Charted Course of Prices, Production, Shipments, Stocks of Principal Refined Products, Week by Week, From Reports Made by 93 Plants to National Petroleum News


Millions of Gallons
Stocks of Fuel Oil at Mid-Continent Refineries
1.00 Cts
.90 Cts
.80 Cts
.70 Cts
.60 Cts
Price of 24-26 Fuel Oil (Group 3) Per Barrel
Production
Shipments
Shaded Area Shows Decrease in Stocks
Oct. 1929 Nov. Dec. Jan. Feb. Mar. Apr May June 1930 July Aug. Sept. Oct. Nov Dec


Millions of Gallons
Stocks of Gas Oil at Mid-Continent Refineries
Price of 32-36 Straw Gas Oil (Group 3)
Cents Per Gallon
3.5 Cts.
3.0 Cts.
2.5 Cts.
Shipments
Production
Shaded Area Shows Decreas in Stocks
Oct. 1929 Nov. Dec. Jan. Feb. Mar. Apr. May June 1930 July Aug. Sept. Oct. Nov Dec.

Important

TO REFINERS and MARKETERS of GASOLINE

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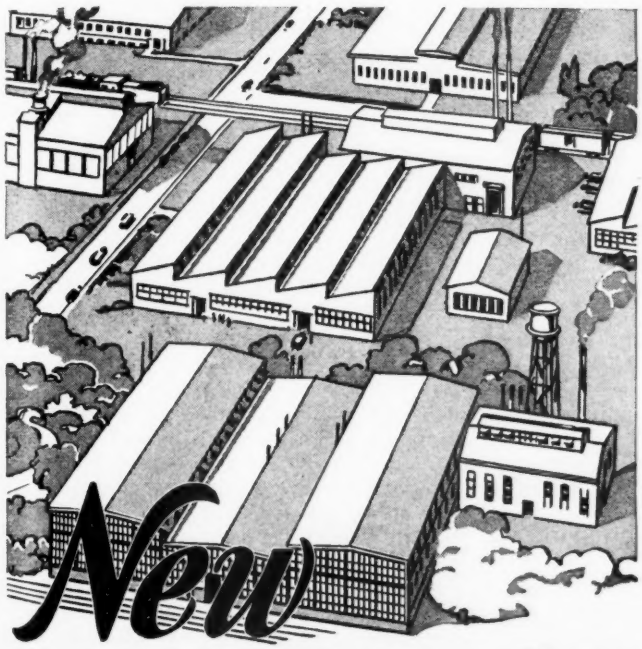

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California Refinery Market

Mid-Continent Gasoline Threatens West Coast

LOS ANGELES, Nov. 8

THREATS offered by the influx of Mid-Continent gasoline into logical California marketing territory featured Pacific Coast markets the past week.

In the export market, shippers reported the receipt of numerous inquiries. One member of the trade reported several queries from Australian buyers seeking cased 400 e.p. gasoline. This occurred in the face of an additional tax of 1.5 per cent of the container's value, on each case entering the country. Prior to Nov. 1, when this increase became effective, the tax was 6 per cent.

Traders are not overly optimistic concerning future business with buyers in Australia as Nov. 1 also marked the initiation of a 1-pence tax on kerosine and lubricating oils.

Practically the only other interesting event in the export market was an inquiry from India for approximately 5000 barrels of Diesel oil. Although the quotations on this small bulk lot were reported as low as $0.86 per barrel, the deal had not been closed up to the end of the week.

For the most part quotations on California products for export were unchanged over the seven-day period. There was an indication here and there that an abundance of fuel oil and natural gasoline on the west coast might cause quotations on these commodities to be shaded.

Traders in the domestic market were developing a feeling of antipathy toward the movement of low-priced Mid-Continent gasoline into territory logically considered theirs.

Spokane has for some time been a point of competition between California and Mid-Continent refiners for gasoline business. Existing low prices in the central states has enabled Group 3 motor fuel to be shipped into this territory at approximately 4 cents under postings by local companies.

To meet competitive conditions at Spokane, Standard of California, Nov. 6, increased the special allowance to the retail trade from 2 to 5.50 cents per gallon on gasoline. No change was made in the posted tank truck price and the special allowance is subject to withdrawal at any time.

There was an indication that Mid-Continent gasoline might even be shipped into certain sections of lower Southern California at prices competitive to local refiners. In general prices to out-of-state buyers were unchanged from quotations made on gasoline last week.

Within the state boundaries there was a marked increase in U. S. Motor gasoline quotations. Although cut price signs continue to advertise motor fuel at from 2 to 6.50 cents under that posted by major companies in the Los Angeles Basin there was a far more optimistic tone to the local situation.

There still remains, however, a rather serious problem for the independent refiner. An inactive fuel oil market has caused quotations to fall to between $0.35 and $0.50 per barrel for spot sales of this commodity. In some instances it cannot be sold even at these low prices.

Quotations on gasoline for in-state consumption ranged from 9.50 to 11.50 cents in tank car lots with the price slightly higher for tank truck and trailer delivery. The low on this spread is about 0.75 cent higher than that of last week.

Demand for gas oil was reported good and a considerable quantity was moved during the week. One dealer said he was quoting between $0.85 and $0.90 per barrel on this product.

An additional flood of natural gasoline on the Pacific Coast market has broken the price to between 6.50 and 7.25 cents per gallon.

Export Association Abandons Posting Price Schedules

NEW YORK, Nov. 10

THE main purpose for which the Export Petroleum Association, Inc. was organized nearly two years ago was temporarily abandoned Nov. 7 when the discontinuance of posting prices at which members must sell their products in foreign markets was announced.

"The Export Petroleum Association, Inc. has today cancelled all of its export price schedules," was the only statement forthcoming from the office of Gilbert H. Montague, 67 Wall Street, vice-president and general counsel of the association. Mr. Montague's office declined to make any comment on the action taken.

From other sources, however, it was learned that this step does not mean the beginning of the dissolution of the organization. This action has been rumored frequently in New York export circles during the last six months. Rumors have gone so far as to say that the Association would be dissolved and re-organized, dissenting members being left out in the reorganization.

The association was organized in January, 1929, under the Webb-Pomerene Act of 1918 which permits the fixing of prices at which exported goods may be sold in foreign markets. Joint development of foreign markets, trade researches, allocation of petroleum shipments so that markets might be supplied from sources nearest to them, thus eliminating expensive cross hauling, and the meeting of foreign competition with a united front were some of the many features which the association was organized to promote although price fixing was the main and most important feature.

There are many among the New York export trade, both members and non-members of the association, who have believed that the association has failed in its main purpose. It is no secret among the trade that there has been considerable dissention among the membership. This has been due largely to the fact that the group has maintained prices over long periods of time which have not permitted the membership to meet foreign competition "with a united front."

According to well informed authorities, a by-law of the association stipulates that prices the group will post cannot be changed until every member is in agreement as to the new prices. There cannot be one dissenting vote.

Russian, Roumanian and independent American oil companies have thrived on the dissenting vote, or votes, ever since the association first started fixing prices. The association's prices have not fluctuated in sympathy with domestic markets. Most of the time in the last two years foreign buyers have been able to go direct to the Mid-Continent field, through independent exporters, and obtain their supplies at considerably under the price levels maintained by the association. Only during periods when posted export prices were lower than domestic market prices have members of the association obtained the business that was consistently theirs in years past.

Independent American exporters have undersold the association's prices

more than 1 cent a gallon at times. Even during the past few weeks, or since the last 1-cent reduction, they have offered to sell foreign buyers at 0.75 cent under association prices.

A large Mid-Continent refiner last summer was reported to have made a contract with an independent exporter at 0.75 cent under. The report was more or less substantiated by a European buyer's purchase which was generally known among London, Paris and New York export circles at that time.

Pennsylvania Markets

Bright Stock More Active

CLEVELAND, Nov. 10.—Price changes were mostly on the downside in the western Pennsylvania refinery market last week. From some sections of the field, reports were somewhat of a favorable nature but traders generally failed to report any improvement in the market from the standpoint of activity.

Inquiries from jobbers for all commodities, except bright stock, continued slow. Demand for the winter grades of bright stock was more active and some manufacturers reported even the ordinary grades were coming in for a little better play. Prices showed little change from the previous week's quotations.

Cold weather together with a rather heavy snowfall in some of the eastern states caused gasoline demand to fall off. The high gravity grades were down 0.25 cent in sympathy with the loss sustained by U. S. Motor the previous week.

Kerosine demand was light. The 45 w.w. grade was off 0.125 cent to 4.625 cents on the low end of the price range. The 46 and 47 w.w. grades were fairly steady.

Demand for fuel oil for cracking stock continued to slacken and with industrial activity showing little, if any, improvement, prices for both the light and heavy fuels were off 0.125 cent.

Neutral oils were easy. One or two refiners reported they were shading their quotations of 17 cents and 11 cents for the 200 and 150 No. 3 color grades, respectively. These prices had held fairly well up until last week.

Cylinder stocks were quiet and several grades were offered at lower prices. Filtered stocks were exceptionally difficult to move, several sellers said, in view of the current low prices for bright stock.

Bids from New York dealers of 2 cents a pound, New York, for wax proved unattractive to sellers. No sales or quotations of white crude scale at less than 2.125 cents were reported.

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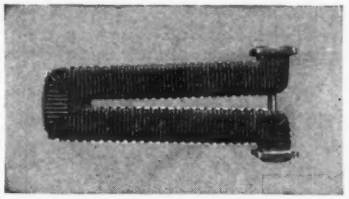

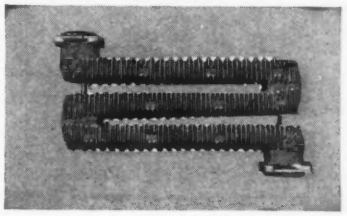

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Eastern Domestic Markets

Gasoline Price Shading Increases

Staff Special
NEW YORK, Nov. 8

GASOLINE markets all along the eastern seaboard were extremely unsettled in the week ended Nov. 8. Buying was in relatively small volume in all districts and reports indicating that prices posted by the major companies were again being shaded materially were more numerous.

Toward the end of the week several major companies, among them the Standard of New Jersey and Standard of New York, announced reductions in their posted prices and this tended to throw markets into an even more chaotic state.

Early in the week sellers of U. S. Motor gasoline at New York harbor had rallied successfully around the 7-cent price. For a day or two it appeared that the general settling of the market to 6.75 cents had been avoided. During the middle days of the week most of the few sales reported by sellers at New York harbor were at 7 cents or higher. However, rumors of price shading began to cloud up the market again later on. Several sellers reported that business could not be closed at 7 cents while a few reported they were moving only a small volume of stuff at 7 to 7.50 cents. Several barge sales of U. S. Motor were reported during the week at 6.50 cents but this price was out of the question as far as tank car lots were concerned.

There was little demand for California gasoline in any of the three districts where this grade is available. The tank car price for this grade at New York harbor was largely nominal at 8 cents a gallon. One seller in the Baltimore district, however, began offering California gasoline at 7.75 cents late in the week, and offered to shade this figure 0.25 cent on lots of 10 or 20 cars. The Philadelphia market for California gasoline was fairly steady at 7.75 cents flat.

Prices for regular U. S. Motor gasoline were generally unchanged in the Philadelphia and Baltimore districts. Rumors were going the rounds that 7 cents could be shaded at Baltimore, but confirmation of actual sales at less than this figure was lacking.

Shading of posted prices was rampant in New England, according to reports from the Boston trade. While the majority of sellers continued to quote a minimum of 8 cents, delivered, for U. S. Motor in the Boston district, they reported running into competition at 0.125 to 0.25 cent under this price. Tank car prices in the Portland district probably will be adjusted to meet the lower price posted by Standard of New York f.o.b. its terminal in this district. Only a few companies have terminals in or near Portland. A good bit of the material moved into this district in the past has come from New England terminals further south, and sellers will have to absorb some of the freight if they are to compete with Standard.

Prices were generally unchanged in the Providence district.

Kerosine prices were unchanged in all districts. Demand for this commodity, generally speaking, was quiet throughout the week.

Burning oils were more active following a drop in temperatures along the northern part of the seaboard to around freezing. Furnace oil, 36-40 gravity, was reported in brisk demand at 5.50 cents at New York harbor. Demand also was reported good in the Boston district. Gas oil was generally unchanged at 4.50 to 4.75 cents in both districts.

Tennessee Jobbers Meet In December

NASHVILLE—The tri-annual convention of the Tennessee Oil Men's Association will be held Dec. 15 and 16 at the Farragut Hotel, Knoxville, according to L. W. Collins, executive secretary.

Gulf Coast Markets

Abandonment of Price Posting Unsettles Market

Staff Special
NEW YORK, Nov. 8

CANCELLATION of its posted price schedules by the Export Petroleum Association and a further easing in the heavy oil market were outstanding features in Gulf Coastal markets the first week of November.

Abandonment of price fixing by the association came too late in the week to determine what effect it would have on bulk prices for gasoline and kerosine. For the last three weeks, a London broker is reported to have been offering at least 64-66, 375 end point gasoline at 0.75 cent under the association's posted price for this grade. According to well informed market observers, association members with a free hand will be out to meet this competition.

Two foreign inquiries for U. S. Motor gasoline came into the market around the middle of the week. No business had been negotiated against these inquiries up to the close of business Saturday as far as could be learned.

The heavy oil market was thrown into disorder again by the report that a cargo of bunker C had been sold at $0.62 a barrel, f.o.b. the Gulf. In some quarters it was indicated that the material was off specification. Confirmation of this fact and verification of the price reported could not be obtained. Most sellers continued to quote $0.65 to $0.75 for grade C in cargo lots although shading of the lower figure has been rumored several times of late.

Venezuela Crude

The market for Venezuela crude remained unchanged throughout the week. Sellers' ideas of prices generally ranged from $0.70 to $0.75 per barrel, f.o.b. deepwater in the Lake Maracaibo region. No inquiries were reported for this oil.

Panuco Crude

Mexican heavy oils also remained unchanged. Panuco crude was quoted by most sellers at $0.55 per barrel, f.o.b. Tampico.

Gulf Lubes Firm; Demand Slow

HOUSTON, Nov. 8.—Gulf Coastal lubricant markets settled to firmer price ranges after reductions reported a week ago following downward adjustments of crude schedules. Most of the manufacturers in the Houston district have list prices conforming to the high of NATIONAL PETROLEUM NEWS ranges, but sell under competitive conditions as low as the lower ranges shown. Demand continues slow.

Wax Markets

Demand Light

NEW YORK, Nov. 8.—Reports of price shading on 128-130 A.m.p. fully refined at New Orleans were the only signs of life in wax markets the past week. This grade was offered 0.125 cent lower at 3.375 cents at New Orleans but remained unchanged at 3.50 cents a pound at New York. Sizable lots were reported offered at 3.375 cents in the former market.

Prices for other grades of fully refined wax and also white crude scale were generally unchanged.

N. P. N. Service Record

Some of the requests for information, data and advice, which were taken care of in various National Petroleum News offices in the past week are:

Pennsylvania inquirer referred to article on automatic control in refineries to be published in N.P.N. Special Engineering Issue of Nov. 12; also to engineering service in New York; and his attention called to series of articles on refinery control to be published in N.P.N. latter part of this year.

* * *

Chicago manager of national oil marketer furnished what information is available on new process for refining oil.

* * *

Sales department of oil company operating world wide told where motor oil statistics and information on trade marks may be obtained.

* * *

Italian subsidiary of large refiner told where engineering journal he inquired about may be obtained.

* * *

Large Ohio soap manufacturer given data on refining and marketing industry, including number of men employed in both, number of service stations in the U. S., number of stations owned by 15 of the largest oil companies, among other information.

* * *

Wisconsin advertising agent telegraphed names and addresses of 10 leading consulting engineers and designers of refinery equipment and cracking processes.

* * *

California natural resources department furnished references to all important N.P.N. articles on Elwood field.

* * *

South Carolina oil jobber referred to N.P.N. series on accounting for small jobber; also to other sources for forms, records, etc.

* * *

Los Angeles oil broker referred to sources for government specifications on all petroleum products.

* * *

Nationally known extension university told how proration of flush fields is determined and carried out.

* * *

Minnesota equipment manufacturer referred to N.P.N. articles giving gasoline consumption figures by states and by months this year.

* * *

Ohio oil jobber referred to N.P.N. article telling how containers of gasoline and denatured alcohol should be labeled.

* * *

Nationally known chain store referred to N.P.N. article on vapor-lock in automotive fuel systems.

* * *

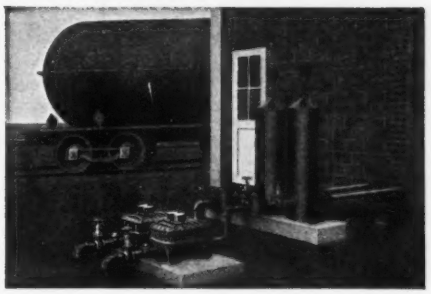
Gasoline prices and conditions discussed with Pennsylvania oil refiner, Pennsylvania law firm, Delaware oil jobber and Montana association operating service stations.

* * *

Missouri oil jobber furnished names and addresses of eight suppliers of Pennsylvania bright stock and neutral oil for compounding motor oil.

* * *

Massachusetts solvents compounder given names and addresses of five eastern manufacturers of stabilized natural gasoline.



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Friction Takes A Heavy Toll
unless you use the right lubricant

Each time machinery starts and stops, the fluid film of lubrication is broken. Then friction takes extra toll, unless the right lubricant is being used.

If friction is to be kept from doing serious damage, an adsorbed film of lubricant must be left upon the surface of the metal bearings when the machinery stops. When the machinery is started again, this protects the bearings until the fluid film is established once more—and friction and wear are reduced.

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HUMBLE OIL & REFINING CO. HUMBLE OILS HOUSTON, TEXAS

HUMBLE OIL & REFINING COMPANY

Complete Seaboard Market

(Export Markets for whole year given in OIL PRICE HANDBOOK. Each volume carries refinery, tank wagon, crude and export markets—complete for the whole year)

Eastern Domestic Market

(Prices for tank car lots, f. o. b. refinery or seaboard terminal, representing majority of sales and quotations. Prices shown below do not include inspection tax levied in some states.)

	Prices Nov. 10	Prices Nov. 3	Prices Oct. 27
U. S. MOTOR GASOLINE			
New York harbor	6.75 – 7.25	6.75 – 7.50	7.00 – 7.50
Portland district	*8.25 – 8.75	*8.75 – 9.50	*8.75 – 9.75
Boston district	*8.00 – 8.25	*8.00 – 8.50	*8.00 – 8.50
Providence district	*8.00 – 8.25	*8.00 – 8.50	*8.00 – 9.00
Philadelphia district	7.00 – 7.50	7.00 – 7.50	7.50 – 8.00
Baltimore district	7.00 – 7.50	7.00 – 7.50	7.50 – 8.00
Norfolk district	7.50 – 7.75	7.50 – 7.75	7.50 – 8.00
Charleston district	7.50 – 7.75	7.50 – 7.75	7.50 – 8.00
Savannah district	7.00 – 7.50	7.50 – 7.75	8.25
Jacksonville district	7.00 – 7.50	7.50 – 7.75	7.50 – 8.25
CALIFORNIA, U. S. MOTOR GASOLINE			
New York harbor	†8.00	7.75 – 8.00	8.00 – 8.25
Philadelphia district	7.75	7.75	8.25
Baltimore district	7.75 – 8.00	8.00	8.00
‡DOMESTIC AVIATION GASOLINE			
New York harbor	10.50 –12.00	10.50 –12.00	10.75 –12.00
Philadelphia	10.50 –12.00	10.50 –12.00	10.75 –12.00
Baltimore	11.00 –13.00	11.00 –13.00	11.00 –12.00
Boston	11.50 –13.00	11.50 –13.00	11.50 –13.00

‡Prices are based on U. S. Gov't. specifications or better. Present Gov't. specifications require distillation range of 5% recovery at not more than 167°F. and not less than 122°F.; 50% recovery at 221°; 90% at 311°; 96% at 347° end point 374°F. Gasoline of fighting grade specifications in some instances sells at a premium over domestic aviation grade. Prices represent majority of quotations.

WATER WHITE KEROSINE			
New York harbor	6.25 – 6.75	6.25 – 6.75	6.25 – 6.75
Philadelphia district	6.25	6.25	6.25 – 6.75
Baltimore district	6.50 – 6.75	6.50 – 6.75	6.50 – 6.75
GAS OIL: 28-34 Gravity			
New York harbor	4.50 – 4.75	4.50 – 5.00	4.50 – 5.25
Boston district	4.50 – 4.75	4.50 – 5.00	4.50 – 5.00
FURNACE OIL: 36-40 Gravity			
New York harbor	5.50 – 6.00	5.50 – 6.00	5.75 – 6.00
Boston district	5.50 – 6.00	5.50 – 6.00	5.50 – 6.00
GRADE C BUNKER OIL (Lighterage 5c per bbl. additional)			
New York harbor	$1.05	$1.05	$1.05
Boston district	$1.00 –$1.05	$1.00 –$1.05	$1.00 – $1.05
DIESEL OIL			
New York harbor	$2.00 –$2.10	$2.00 –$2.10	$2.00 –$2.10

†Nominal. *Delivered prices.

New York Export Market

(Lubricating oils are per gal. in bbls. F.a.s. New York)

	Nov. 10	Nov. 3	Oct. 27
CYLINDER OILS (Pennsylvania Products)			
Bright stock, No. 8 color	28.00 –30.00	28.00 –30.00	28.00 –30.00
Bright stock, No. 6½ color diluted	26.00 –28.00	.....	.....
600 D filtered	24.00 –28.00	24.00 –28.00	24.00 –28.00
600 Warren E. filtered	22.00 –25.00	22.00 –25.00	22.00 –25.00
600 stm. refd. unfiltered	17.00 –18.00	17.00 –18.00	17.00 –18.00
650 stm. refd. unfiltered	20.75 –22.00	20.75 –22.00	20.75 –22.00
600 flash, steam refined	23.00 –25.00	23.00 –25.00	23.00 –25.00
630 flash, steam refined	31.00 –33.00	31.00 –33.00	31.00 –33.00
RED PARAFFIN OILS (Vis. 100°)			
300 vis. No. 6½ color	17.00 –19.00	17.00 –19.00	17.00 –19.00
250 vis. No. 6 color	16.50 –17.50	16.50 –17.50	16.50 –17.50
200 vis. No. 6 color	16.25 –17.00	16.25 –17.00	16.25 –17.00
PALE PARAFFIN OILS (Vis. 100°)			
230 vis. No. 3¾ color	21.50	21.50	21.50
180 vis. No. 3¼ color	17.00 –18.00	17.00 –18.00	17.00 –18.00
100 vis. No. 2¼ color	12.50 –15.00	12.50 –15.00	12.50 –15.00
MOTOR OILS (Vis. 100°)			
600 vis. No. 7 color	30.00 –32.00	30.00 –32.00	30.00 –32.00
500 vis. No. 6½ color	27.50 –30.00	27.50 –30.00	27.50 –30.00
400 vis. No. 7¼ color	26.00 –29.00	26.00 –29.00	26.00 –29.00
300 vis. No. 6 color	22.00 –26.00	22.00 –26.00	22.00 –26.00
200 vis. No. 6 color	21.00 –23.50	21.00 –23.50	21.00 –23.50

Wax Market

(Prices in cents per pound, A.S.T.M. tests except melting points which are American. F.a.s. carload lots)

NEW YORK	Nov. 10	Nov. 3	Oct. 27
124-126 Yellow crude scale	2.125– 2.25	2.125– 2.25	2.125– 2.25
122-124 White crude scale	2.25 – 2.375	2.25 – 2.375	2.25 – 2.375
124-126 White crude scale	2.25 – 2.375	2.25 – 2.375	2.25 – 2.375
123-125 Fully refined	3.125	3.125	3.125– 3.25
125-127 Fully refined	3.125– 3.25	3.125– 3.25	3.25 – 3.50
128-130 Fully refined	3.50 – 3.625	3.50 – 3.625	3.50 – 3.625
130-132 Fully refined	3.625– 3.875	3.625– 3.875	3.625– 3.875
133-135 Fully refined	4.25 – 4.375	4.25 – 4.50	4.25 – 4.50
135-137 Fully refined	4.625	4.625	4.625
NEW ORLEANS			
124-126 Yellow crude scale	2.125– 2.25	2.125– 2.25	2.125– 2.25
122-124 White crude scale	2.25 – 2.375	2.25 – 2.375	2.25 – 2.375
124-126 White crude scale	2.25 – 2.375	2.25 – 2.375	2.25 – 2.375
123-125 Fully refined	3.00 – 3.125	3.00 – 3.125	3.125– 3.25
125-127 Fully refined	3.00 – 3.25	3.00 – 3.25	3.25 – 3.375
128-130 Fully refined	3.375– 3.50	3.50	3.50
130-132 Fully refined	3.625– 3.75	3.625– 3.75	3.625– 3.75
133-135 Fully refined	4.25 – 4.375	4.25 – 4.375	4.25 – 4.375

Gulf Coast Bulk Market

(Prices are f. o. b. Gulf oil terminals covering bulk shipments of 20,000 barrels or more, for export and / or coastwise shipment, unless otherwise noted).

GASOLINE	Prices Nov. 10	Prices Nov. 3	Prices Oct. 27
U. S. Motor	6.50	7.00	7.00
60-62, 400 e.p.	7.00	7.50	7.50
61-63, 390 e.p.	7.25	7.75	7.75
64-66, 375 e.p.	7.50	8.00	8.00
U. S. Motor, cases (cargoes)	$1.75	$1.75	$1.75
64-66, cases (cargoes)	$1.85	$1.85	$1.85
KEROSINE			
44 water white	5.75	6.00	6.00
41-43 prime white	4.75	5.00	5.00
Water white, cases (cargoes)	$1.45	$1.45	$1.45
Prime white, cases (cargoes)	$1.35	$1.35	$1.35
GAS & BUNKER OILS			
*26-30 translucent gas oil	3.50 – 3.75	3.50 – 3.75	3.50 – 3.75
*30 plus translucent gas oil	3.75	3.75	3.75
Grade C bunker oil, for ships' bunkers, per bbl.	$0.90 –$1.00	$1.00	$1.00 –$1.05
Grade C bunker oil, per bbl. in cargoes	$0.65 –$0.75	$0.65 –$0.75	$0.65 –$0.75
Grade C bunker oil, per bbl., cargoes, for shipment to Gulf ports	$0.85	$0.85 –$0.90	$0.85 –$0.90

*Less than ½ of 1% sulphur.

MEXICAN CRUDE AND BUNKER OILS (f. o. b. Steamer, Tampico)			
Heavy Panuco crude taxes to be paid, per bbl.	$ 0.55 –$0.60	$0.55 –$0.60	$0.55 –$0.60
Grade C bunker oil for bunkering, taxes paid, per bbl.	$1.00	$1.00	$1.00

SOUTH TEXAS LUBRICATING OILS (Viscosity at 100°F. cold test 0 Tanker, f. o. b. Houston)			
100 vis. No. 2 unfiltered pale	5.50 – 5.75	5.50 – 5.75	5.75 – 6.125
200 vis. No. 3 unfiltered pale	7.625– 8.25	7.625– 8.25	8.00 – 8.75
300 vis. No. 3 unfiltered pale	8.75 – 9.50	8.75 – 9.50	8.875– 9.50
500 vis. No. 3½ unfiltered pale	9.50 –10.50	10.00 –10.50	10.25 –11.25
750 vis. No. 4 unfiltered pale	12.00 –12.75	12.00 –12.75	12.50 –13.25
1200 vis. No. 4 unfiltered pale	14.00 –16.00	14.00 –16.00	16.00 –18.00
200 vis. No. 5-6 red oil	6.75 – 7.50	7.00 – 7.50	7.00 – 7.50
300 vis. No. 5-6 red oil	8.00 – 8.50	8.00 – 8.50	8.375– 8.75
500 vis. No. 5-6 red oil	9.00 – 9.375	9.00 – 9.375	9.25 – 9.50
750 vis. No. 5-6 red oil	10.50 –11.50	10.50 –11.50	11.50
1200 vis. No. 5-6 red oil	13.50 –15.00	13.50 –15.00	15.00 –15.50

Pacific Export Market

(Quotations are at seaboard, Los Angeles, in cargo lots, cents per gallon, except where otherwise noted.)

	Nov. 10	Nov. 3	Oct. 27
Gasoline, U. S. Motor, 53-55 Gravity	6.50 – 7.50	6.50 – 7.50	6.50 – 7.50
Gasoline, U. S. Motor-blends and special cuts	7.00 – 8.25	7.00 – 8.25	7.25 – 8.25
Gasoline, 400 e.p. blend.	8.25 – 9.25	8.25 – 9.25	8.25 – 9.25
Gas Oil, 30-34 per bbl.	$0.87 –$1.05	$0.87 –$1.05	$0.87 –$1.00
Diesel Oil, plus, per bbl.	$0.85 –$1.05	$0.85 –$1.05	$0.85 –$1.00
Bunker oil, 14-18 per bbl.	$0.64 –$0.85	$0.64 –$0.85	$0.65 –$0.90
Fuel oil, 14-18 per bbl.	$0.60 –$0.85	$0.60 –$0.85	$0.60 –$0.85
Kerosine, 38-40 w.w., 125-150 flash, per gal.	5.00 – 6.00	5.00 – 6.00	5.00 – 6.00
Cased Goods			
Gasoline, U. S. Motor	$1.75 –$1.85	$1.75 –$1.85	$1.75 –$1.85
Gasoline, 400 e.p. blend	$1.85 –$2.00	$1.85 –$2.00	$1.85 –$2.00
Kerosine, 38-40 w.w., 125-150 flash	$1.45 –$1.50	$1.45 –$1.50	$1.45 –$1.50

Tanker Rates

(Approximate tanker freight rates to Continental ports, in shillings per ton of 2240 pounds, British sterling; to American ports, cents per barrel.)

	Nov. 10 Crude &/or Fuel	Nov. 10 Refined Oil &/or Spirits
Calif. to U. K. or Continental ports*	21	18
Gulf to U. K. or Continental ports*	11	10
North Atlantic to U. K. or Continental ports*	9/6	8/6
Calif. to North Atlantic ports (not E. of N. Y.)	$0.50	$0.45–$0.50
Gulf to North Atlantic ports (not E. of N. Y.)**	14–16	16–18

*Continental ports in the range between Bordeaux and Hamburg, both inclusive. **Venezuela loading same rate. For Tampico 2c to 3c per bbl. additional.

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For Domestic or Export

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UNFILTERED AND FILTERED
BRIGHT STOCKS
COLD SETTLED AND CENTRIFUGED
PALE—RED OILS
WAX—PETROLATUM
TECHNICAL WHITE OILS
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Interested in.....

Size..... Truck.....

Other Equipment.....

Name.....

Address.....

Tank Wagon, Service Station Markets for Gasoline and Kerosine

(OIL PRICE HANDBOOK has t.w. and s.s. markets for a whole year, arranged for quick reference)

These Prices in Effect Nov. 10, 1930, as Posted by Principal Marketing Companies

S.O. NEW JERSEY TERRITORY

	Gasoline Total				Oil
	T.W.	Tax	T.W.	S.S.	T.W.
Atlantic City, N. J.	12.5	2	14.5	15.5	11.5
Newark, N. J.	11.5	2	13.5	14.5	10.5
Annapolis	12	4	16	17	11
Baltimore, Md.	11.2	4	15.2	16.2	9.5
Cumberland, Md.	13	4	17	18	12
Washington, D. C.	11.7	2	13.7	14.7	10.7
Danville, Va.	12.8	5	17.8	18.8	11.8
Norfolk, Va.	11.3	5	16.3	17.3	10
Richmond, Va.	11.7	5	16.7	17.7	10.7
Roanoke, Va.	13	5	18	19	12
Petersburg, Va.	12.3	5	17.3	18.3	11.3
Charleston, W. Va.	12.5	4	16.5	17.5	11.5
Keyser, W. Va.	13.1	4	17.1	18.1	12.1
Parkersburg, W. Va.	11.2	4	15.2	16.2	10.2
Wheeling, W. Va.	12.4	4	16.4	17.4	11.4
Raleigh, N. C.	13.2	5	18.2	19.2	12.2
Charlotte, N. C.	13.3	5	18.3	19.3	12.3
Hickory, N. C.	13.6	5	18.6	19.6	12.6
Mt. Airy, N. C.	13.5	5	18.5	19.5	12.5
Salisbury, N. C.	13.5	5	18.5	19.5	12.5
Charleston, S. C.	11.3	6	17.3	18.3	10.3
Columbia, S. C.	13.2	6	19.2	20.2	12.2

Note: 2c per gallon discount off retail t.w. price of gasoline to dealers only thru S. O. New Jersey territory, except Washington, D. C. where discount is 3c.

CONTINENTAL OIL

	Gasoline Total				Oil
	T.W.	Tax	T.W.	S.S.	T.W.
Denver, Colo.	12	4	16	19	13.5
Pueblo, Colo.	13	4	17	20	13.5
Grand Junc., Colo.	14	4	18	21	17
Casper, Wyo.	13	4	17	20	12
Cheyenne, Wyo.	14	4	18	21	13.5
Butte, Mont.	14	5	19	22	18
Helena, Mont.	17.5	5	22.5	25.5	18
Salt Lake City, Utah	16.5	3½	20	23	17
Boise, Ida.	18.5	5	23.5	26.5	19
Twin Falls, Ida.	18.5	5	23.5	27.5	19
Albuquerque, N. M.	11	5	16	18	15

S. O. CALIFORNIA

	Gasoline			Oil
	Tax	Posted Retail Price	Wholesale	T.W.
Phoenix, Ariz.	4	22.5	19.5	20
Los Angeles, Cal.	3	20.5	22.5	15.5
Fresno, Cal.	3	21	23	17
San Francisco, Cal.	3	21	23	15.5
Reno, Nev.	4	26	28	19
Portland, Ore.	4	22.5	24.5	16.5
Seattle, Wash.	3	21.5	23.5	16.5
Spokane, Wash.	3	*25.5	27.5	20.5
Tacoma, Wash.	3	21.5	23.5	16.5

Note: 6c per gal. discount to dealers off posted wholesale price of gasoline to customers taking tank truck delivery, thru S. O. California territory except 1c discount at Phoenix to dealers only. This discount determines net t.w. price.

***Nov. 8, S. O. California increased special discount to retail gasoline trade at Spokane to 5.5c per gal.**

S. O. LOUISIANA

	Gasoline				Oil
	Posted Retail		Total Posted		Posted Retail
	T.W.	Tax	T.W.	S.S.	T.W.
Little Rock, Ark.	10	5	15	16	12
Alexandria, La.	10.5	*5	15.5	16.5	†13
Baton Rouge, La.	10.5	4	14.5	15.5	†13
New Orleans, La.	8.5	*5	13.5	14.5	†12
Lake Charles, La.	10.5	*5	15.5	16.5	†13
Shreveport, La.	10.5	4	14.5	15.5	†13
Lafayette, La.	10.5	*5	15.5	16.5	†13
Bristol, Tenn.	14	5	19	20	14
Chattanooga, Tenn.	12.5	5	17.5	18.5	13
Knoxville, Tenn.	13	5	18	19	15
Nashville, Tenn.	12	5	17	18	15
Memphis, Tenn.	11	5	16	17	12.5

Note: Discounts in S. O. La. territory: To dealers and commercial consumers from the tankwagon, 2c per gal. off posted retail t.w. price; to consumers at service stations when cash is paid for purchases at time of delivery, 1c per gal. off posted retail s.s. price.

***Lake Charles, Alexandria, New Orleans and Lafayette gasoline tax includes 4c state tax and 1c parish tax. New Orleans kerosine price includes 1c parish tax in addition to 1c state tax.**

†Kerosine price in Louisiana includes 1c state tax.

Latest Changes in Tank Wagon Prices

Gasoline

S. O. New Jersey—S. s. only cut 1c thru territory, except Delaware, and Roanoke, Va., unchanged, **Nov. 4.**

Atlantic Refining—S. s. only cut 1c thru New Jersey, Maryland and Virginia, **Nov. 4.**

T. w. and s. s. cut 1c thru Pennsylvania and Delaware, except s. s. at Erie unchanged, **Nov. 6.**

T. w. and s. s. cut 2c, Boston, to 14.5c and 16.5c, **Oct. 3.**

T. w. only cut 1c, Providence, to 12.7c, **Oct. 11.**

T. w. cut 2c, Wilmington, to 16.4c, **Sept. 24,** and s. s. cut 3c, to 17.4c, **Nov. 4.**

S. O. Ohio—T. w. up 4c, s. s. 5c, Summit County, to statewide prices of 18c and 19c, **Nov. 7.**

S. O. Louisiana—T. w. and s. s. cut 1c, Chattanooga, Knoxville, Memphis and Nashville, **Nov. 4.**

T. w. and s. s. up 2c, Little Rock, to 15c and 16c, **Nov. 6.**

Continental Oil—T. w. and s. s. cut 2.5c, Grand Junction, to 18c and 21c, **Nov. 6.**

Aviation gasoline cut 1c, Helena, to 28.5c, **Oct. 1.**

S. O. California—Special discount to retail gasoline trade at Spokane increased to 5.5c, from 2c, Nov. 8.

Kerosine

Atlantic Refining—Kerosine cut 2.5c, Hartford, and 2.6c, New Haven, both to 10c t. w., **Sept. 6.**

S. O. Kentucky—Kerosine cut 1c, Atlanta, to 13.5c, **Nov. 3.**

Magnolia Petroleum—Kerosine cut 1c, Dallas, to 11c t. w., **Oct. 22.**

Kerosine cut 1c, Ft. Worth, to 10c t. w., **Oct. 27.**

S. O. KENTUCKY

	Gasoline Total				Oil
	T.W.	Tax	T.W.	S.S.	T.W.
Ashland, Ky.	13	5	18	20	15
Catlettsburg, Ky.	13	5	18	20	15
Lexington, Ky.	12	5	17	18	14.5
Louisville, Ky.	11	5	16	18	12
Covington, Ky.	13	5	18	20	14.5
Clarksdale, Miss.	13	5	18	20	12.5
Gulfport, Miss.††	14	5	19	19	13
Jackson, Miss.	10	5	15	17	13
Natchez, Miss.	13	5	18	20	13
Vicksburg, Miss.	13	5	18	20	13
Birmingham, Ala.‡‡	14	4	18	20	14.5
Mobile, Ala.‡	13	4	17	19	11.5
Montgomery, Ala.*	14	4	18	20	15
Atlanta, Ga.	14	6	20	22	†13.5
Augusta, Ga.	14	6	20	22	†15.5
Macon, Ga.	14	6	20	22	†13
Savannah, Ga.	14	6	20	22	†14
Jacksonville, Fla.	11	6	17	19	14
Miami, Fla.	13	6	19	21	14
Tampa, Fla.	12	6	18	20	13
Pensacola, Fla.**	14	6	20	21	13.5

Note: Net price of gasoline to dealers is 2c under posted t.w. price thru S. O. Kentucky territory.

***Local privilege tax of 1 cent on gasoline and ½ cent on kerosine at Montgomery included.**

†Georgia kerosine prices include 1c state tax.

****Both tank wagon prices include 1c city tax at Pensacola which went into effect Oct. 15, 1926.**

††Both tank wagon prices at Gulfport include Harrison county privilege tax of 2c.

‡Mobile gasoline prices include 1c city tax.

‡‡Birmingham gasoline prices include 1c city tax.

S. O. NEBRASKA

	T.W.	Tax	T.W.	S.S.	T.W.
Omaha, Neb.	13.25	4	17.25	18.25	11.25
McCook	14.75	4	18.75	20.75	12.75
Norfolk	13.25	4	17.25	17.25	11.75
North Platte	14.75	4	18.75	20.75	12.50
Scottsbluff	13	4	17	17	12.25

Note: Discounts: 1c per gal. off tank wagon price of gasoline for 1,000 gallon dumps per month to consumers taking tank wagon delivery only.

S. O. INDIANA

Chicago, Ill.	13	3	16	17	11
Decatur, Ill.	13.4	3	16.4	17	11
E. St. Louis, Ill.	12.4	3	15.4	16.4	10.2
Joliet, Ill.	13.4	3	16.4	17.4	11
Peoria, Ill.	13.4	3	16.4	15	11
Quincy, Ill.	13.2	3	16.2	17.2	10.8
Indianapolis, Ind.	12.9	4	16.9	17.9	12.2
Evansville, Ind.	13	4	17	18	12
South Bend, Ind.	12	4	16	17	12.2
Detroit, Mich.	13.8	3	16.8	14.3	12.7
Grand Rapids, Mich.	12.7	3	15.7	16.7	12.6
Saginaw, Mich.	13.9	3	16.9	14.5	12.8
Green Bay, Wisc.	13.6	2	15.6	16.6	11.4
Madison, Wisc.	13.3	2	15.3	16.3	11.1
Milwaukee, Wisc.	13.1	2	15.1	15	10.9
La Crosse, Wisc.	14.2	2	16.2	17.2	12
Minneapolis, Minn.	14	3	17	17	11.9
Duluth, Minn.	14.5	3	17.5	18.5	11.9
Mankato, Minn.	11	3	14	14	11.7
Des Moines, Ia.	12.5	3	15.5	16.5	11.3
Davenport, Ia.	13.5	3	16.5	17.5	11.3
Sioux City, Ia.	13.1	3	16.1	15.9	10.9
Mason City, Ia.	13.5	3	16.5	17.5	11.3
St. Louis, Mo.	*10.9	2	12.9	13.9	10.3
Kansas City, Mo.	†12.9	2	14.9	15.9	9.6
St. Joseph, Mo.	†13.5	2	15.5	11.9	10.1
Fargo, N. D.	15.9	3	18.9	19.9	13.9
Grand Forks, N. D.	16.2	3	19.2	20.2	14.2
Minot, N. D.	15.9	3	18.9	19.9	13.9
Pierre, S. D.	14	4	18	19	12.4
Huron, S. D.	13.5	4	17.5	17.5	12.7
Wichita, Kans.	11.8	3	14.8	14.8	9.8
Bartlesville, Okla.	11.5	4	15.5	18.5	11.5

S. O. Indiana's quantity contract price schedule thru territory (except in Chicago, which see below) on tank truck deliveries of gasoline, figured from the service station price is 3c for 500 gal. or more a month; and 4½c for 75,000 gals. or more a month.

In Chicago and vicinity, these discounts apply: Over 500 gals. per month, 4c per gal. off service station price; over 1,000 gals. per month, 5c per gal. off service station price.

*****Includes city tax of ½c.

†Includes city tax of 1c.

S. O. OHIO

Ohio statewide	14	4	18	19	15
Preble County	14	4	18	18	15
Butler County	11	4	15	15	15

Note: Discount on gasoline to dealers and commercial consumers generally thru Ohio is 2c per gal. off above t.w. prices. In counties where prices are below statewide schedule, discount is 3c per gal. off t.w. price.

Discount on kerosine to dealers and commercial consumers is 3c per gal. off t.w. price thru Ohio.

Above prices include these inspection fees on both gasoline and kerosine, per gallon: Alabama, 1/40c on gasoline, 1/2c kerosine; Arkansas, 1/20c on both Florida, 1/8c on both; Illinois, 3/100c on both; Indiana, 4/25c to 1/2c on both; Kansas, 3/50c on both; Louisiana, 1/32c on gasoline; Minnesota, 3/50c on both; Missouri, 3/10c to 1/2c on both; Nebraska, 3/100c on both; North Carolina, 1/4c on both; North Dakota, 1/20c on both; Oklahoma, 4/25c on both; South Carolina, 1/8c on both; South Dakota, 1/10c on both; Tennessee, 2/5c on gasoline and 1/2c to 4/5c on kerosine; Wisconsin, 3/50c on both.

Kerosine inspection fees only, per gallon; Iowa 7/100c; Michigan 1/5c to 4/5c per gal.

Tank Wagon, Service Station Markets for Gasoline and Kerosine

These Prices in Effect Nov. 10, 1930, as Posted by Principal Marketing Companies

MAGNOLIA PETROLEUM

	T.W.	Tax	Gasoline Total T.W.	S.S.	Oil T.W.
Muskogee, Okla.	11	4	15	18	9
Oklahoma City	9	4	13	16	10
Tulsa, Okla.	10	4	14	18	10
Fort Smith, Ark.†	10.5	4	14.5	15.5	12
Little Rock, Ark.	8	5	13	14	12
Texarkana, Ark.*	13	4	17	17	12
Dallas, Tex.	10	4	14	17	11
Fort Worth, Tex.	10	4	14	17	10
Houston, Tex.	11	4	15	19	11
San Antonio, Tex.	9	4	13	17	11
El Paso, Tex.	12	4	16	20	13

*Within city of Texarkana, the state tax on gasoline is 4c per gal. conforming with the Texas state tax. In this district outside of the city the 5c Arkansas tax applies.

†Within city of Fort Smith, Oklahoma tax of 4c applies. In this district outside of the city, the 5c Arkansas tax applies.

S. O. NEW YORK

Greater New York City: Boroughs of Manhattan, Bronx, Queens & Kings	12.3	2	14.3	16.3	10
Borough of Richmond	13.7	2	15.7	17.7	11.7
Albany, N. Y.	13.6	2	15.6	17.6	12.6
Buffalo, N. Y.	12.8	2	14.8	16.8	9
Rochester, N. Y.	13	2	15	17	9
Syracuse, N. Y.	15.8	2	17.8	19.8	12.8
Boston, Mass.	12.5	2	14.5	16.5	10
Augusta, Me.	15.8	4	19.8	21.8	12.8
Manchester, N. H.	15.4	4	19.4	21.4	10
Burlington, Vt.	16.3	4	20.3	22.3	13.3
New Haven, Conn.	15.6	2	17.6	19.6	12.6
Providence, R. I.	10.7	2	12.7	14.7	10

Note: S. O. New York allows 3c off t.w. price to dealers in New York City, and 2c off t.w. price thru rest of territory.

ATLANTIC REFINING

Pittsburgh, Pa.	14	*	14	19	12
Philadelphia, Pa.	14	*	14	19	12
Allentown, Pa.	14	*	14	19	12
Erie, Pa.	14	*	14	18	11
Scranton, Pa.	14	*	14	19	12
Altoona, Pa.	14	*	14	19	12
Dover, Del.	14	3	17	19	12
Wilmington, Del.	14	3	17	19	12
Boston, Mass.	12.5	2	14.5	16.5	10
Springfield, Mass.	15.5	2	17.5	19.5	10
Worcester, Mass.	15.3	2	17.3	19.3	10
Fall River, Mass.	12.1	2	14.1	15.1	10
Providence, R. I.	10.7	2	12.7	14.7	10
Hartford, Conn.	15.5	2	17.5	19.5	10
New Haven, Conn.	15.6	2	17.6	19.6	10
Atlantic City, N. J.	12.5	2	14.5	15.5	11.5
Camden, N. J.	11.6	2	13.6	14.6	10.6
Trenton, N. J.	12	2	14	15	11
Annapolis, Md.	12	4	16	17	11
Baltimore, Md.	11.2	4	15.2	16.2	10.2
Hagerstown, Md.	12.7	4	16.7	17.7	11.7
Richmond, Va.	11.7	5	16.7	17.7	10.7
Wilmington, N. C.	11.4	5	16.4	17.4	12.4
Brunswick, Ga.	14	6	20	22	**15
Jacksonville, Fla.	13	6	19	19	14

Note: 2c per gal. discount off t.w. price of gasoline on sales to dealers; discount to commercial accounts under contract for one year in accordance with Code of Ethics. Erie has dealer discount of 4c off t.w. price, effective May 28.

*3-cent state tax is collected by retail dealer and paid by him directly to state.

**Georgia kerosine prices include 1c state tax.

V. M. & P. NAPHTHA

(Changes ordinarily occur coincident with gasoline price changes)

	Oleum Sprits	V.M.&P. Naphtha	Cleaner Naphtha
Chicago	14.7	16.7	17
Detroit	17.4	18.9	20.7
Kansas City	†15.9	†17.4	†19.2
Milwaukee	16.4	*19.9	*21.7
Minneapolis	**20.7	**22.2	**24
St. Louis	13.9	17.1	18.9
New York		10	23
Boston		19	23

*Includes 2c state tax. †Includes 1c city tax.
**Includes 3c state tax.

Petroleum Spirits (Solvent)

Tank Cars (F.o.b. refinery or seaboard terminal)

New York harbor	10.00
Philadelphia district	10.00
Providence	11.50
Tank Wagon or Steel Barrels	
New York City	15–16
Syracuse	17–18
Rochester	18
Buffalo	16–18
Providence	17–18
Boston	18–19
Bridgeport	16–18
Newark	14–16
Philadelphia	16–17
Baltimore	16–18

Note: 2c off above t.w. prices to large buyers in some instances.

CANADA

(Per Imperial Gallon, which is 1.2 American Gallons)

ONTARIO	T.W.	Tax	Gasoline Total T.W.	S.S.	Oil T.W.
Toronto	18.5	5	23.5	27	19.5
Ottawa	18.5	5	23.5	27	19.5
North Bay	21.5	5	26.5	32	26
Ft. William	21.5	5	26.5	30	21.5
Border Cities, including Windsor	17.5	5	22.5	26	18.5
MANITOBA					
Winnipeg	20	5	25	29	20.5
SASKATCHEWAN					
Regina	25	5	30	34	25
ALBERTA					
Edmonton	26.5	5	31.5	35	26.5
Calgary	22.5	5	27.5	31	22.5
BRITISH COLUMBIA					
Vancouver	23	5	28	32	24
QUEBEC					
Montreal	19.5	5	24.5	28	20.5
Quebec City	20.5	5	25.5	29	21.5
Three Rivers	20.5	5	25.5	29	21.5
NEW BRUNSWICK					
St. John	19	5	24	28	21
Moncton	19	5	24	28	21
NOVA SCOTIA					
Halifax	19	5	24	28	21
PRINCE EDWARD ISLAND					
Charlottetown	19	5	24	28	21

Note: In districts surrounding these points 1c additional is added to city price.

Aviation Gasoline Prices

Following are tank wagon prices of aviation gasoline in principal marketing territories showing state and municipal taxes:

S. O. NEW JERSEY

Prices in Effect Nov. 10, 1930

	T.W.	Tax	T.W.
Newark, N. J.	17.4	*	17.4
Baltimore, Md.	16.2	4	20.2
Washington, D. C.†	18.0	2	20.0

*New Jersey road tax of 2c does not apply on aviation gasoline, exemption being claimed at time of purchase.

†Price at Washington is on Stanavo Aviation gasoline which sells at a ½c premium over "Standard" aviation gasoline.

S. O. PENNSYLVANIA

Philadelphia, Pa.	19	3	22
Pittsburgh, Pa.	19	3	22
Altoona, Pa.	19	3	22

Above prices are on Stanavo Aviation gasoline.

S. O. OHIO

Thru Ohio	16	4	20

Discounts given by S. O. Ohio: For airport delivery only; 2,000 gals. or over per month, 1c per gal.; 6,000 gals. or over per month, 2c; 12,000 gals. and over per month, 3c; 24,000 gals. and over per month, 4c.

S. O. INDIANA

Chicago	17	3	20
Indianapolis, Ind.	17.2	4	21.2
Detroit, Mich.	17.8	3	20.8
Milwaukee, Wis.	17.1	2	19.1
Minneapolis, Minn.	18.2	3	21.2
St. Louis, Mo.	16.4	2½	18.9
Kansas City, Mo.	16.9	3	19.9
Fargo, N. D.	19.9	3	22.9
Huron, S. D.	18.3	4	22.3
Wichita, Kan.	15.8	3	18.8

In S. O. Indiana territory, buyer pays state and city taxes on aviation gasoline, and if he can get a refund from the state, he does so. St. Louis tax of 2½c includes ½c city tax and Kansas City tax includes 1c city tax.

S. O. LOUISIANA

New Orleans, La.	18	5	23
Nashville, Tenn.	20	5	25
Memphis, Tenn.	19	5	24

2c per gal. discount off above t.w. prices to dealers and commercial consumers.

(Continued on page 300)

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THE PETROLEUM IRON WORKS COMPANY

SHARON, PA.

NEW YORK CHICAGO TULSA

Crude Oil Prices (in Effect Nov. 10, 1930)

Crude prices for the whole year in OIL PRICE HANDBOOK published annually

EASTERN FIELDS

(Posted by Joseph Seep Purchasing Agency)

Bradford—Alleghany district (posted by Tide Water Pipe Co., Ltd.)(Effective Nov. 1, 1930) $2.30
Penna. Grade Oil in National Transit Lines (Effective Nov. 1, 1930) *2.00
Penna. Grade Oil in Southwest Penna. Pipe Lines (Effective Nov. 1, 1930) 1.95
Penna. Grade Oil in Eureka Pipe Lines (West Virginia) (Effective Nov. 1, 1930) 1.85
Penna. Grade Oil in Buckeye Pipe Lines (Macksburg, O.) (Effective Nov. 1, 1930) 1.60
Wayne district crude in Cumberland lines (West Virginia) (Effective Oct. 29, 1930) 0.97
Corning Grade in Buckeye Pipe Lines (Ohio) (Effective Oct. 28, 1930) 1.25
Somerset Oil in Cumberland Pipe Lines (Kentucky) (Effective Oct. 29, 1930) 1.10
Somerset Oil in Eureka Pipe Lines (Effective Oct. 29, 1930) 0.94
Ragland Grade in Cumberland Pipe Lines (Kentucky) (Effective Jan. 9, 1929) $0.60
*Oil run prior to July 1, 1929 is 5c less per bbl.

(Posted by Stoll Oil Refining Co.)

Oil City, Ky., oil in Stoll lines (Effective Nov. 10, 1930) $1.00

MICHIGAN

(Posted by Dixie Oil Co.)

Traverse and Dundee (Muskegon), effective Oct. 28, 1930, same gravity and price schedule as Prairie posts in Oklahoma and Kansas, which see below.

(Posted by Pure Oil Co.)

Midland, Midland County (Oct. 28, 1930) $1.10

CENTRAL STATES FIELDS

Posted by Ohio Oil Co.

Effective Oct. 28, 1930

Wooster	$1.35	Princeton	$1.30
Lima	1.10	Illinois	1.30
Waterloo	1.20	Plymouth	0.88
Indiana	0.87	West Kentucky	1.15

CANADIAN CRUDE

Posted by Imperial Oil Refineries, Ltd.

Effective Oct. 28, 1930

Petrolia $1.50
Oil Springs 1.57

OKLAHOMA, KANSAS and NORTH TEXAS

Prices of Prairie Oil & Gas Co.

(In Oklahoma, Kansas, North and East Central Texas)

Effective Nov. 1, 1930

Below 29	$0.65	35-35.9	$0.92
29-29.9	0.69	36-36.9	0.95
30-30.9	0.73	37-37.9	0.98
31-31.9	0.77	38-38.9	1.01
32-32.9	0.81	39-39.9	1.04
33-33.9	0.85	40 and above	1.07
34-34.9	0.89		

Oct. 25, Stanolind Crude Oil Purchasing Co. same schedule in Oklahoma-Kansas as Prairie. On Oct. 27, The Texas Co. met Prairie prices in Oklahoma, and on Oct. 28, in North Texas and North Central Texas.

Humble Oil & Refining Co. Prices

Effective Oct. 28, 1930

In Ranger, North Texas, Mexia, Powell, Boggy Creek, Richland, Wortham, Lytton Springs, Currie, Moran and Nocona fields, all in Texas, same prices as Prairie, which see above.

Magnolia Petroleum Co.

(In Oklahoma, Kansas, North and East Central Texas)

Effective Oct. 28, 1930

Magnolia posts same prices in all three states as Prairie, except these lower grades:

Below 26	$0.53	27-27.9	$0.61
26-26.9	0.57	28-28.9	0.65

Effective Oct. 28, 1930

Corsicana heavy	$0.75
Luling	0.75
Mirando	0.75
Darst Creek, 60° and above	0.90

Carter Oil Co.

(Oklahoma and Kansas)

Oct. 27, 1930, same schedule as Prairie, which see above.

PANHANDLE TEXAS

Humble Oil & Refining Co.

Effective Oct. 28, 1930

Hutchinson and Carson Counties

Below 29	$0.45	35-35.9	$0.72
29-29.9	0.49	36-36.9	0.75
30-30.9	0.53	37-37.9	0.78
31-31.9	0.57	38-38.9	0.81
32-32.9	0.61	39-39.9	0.84
33-33.9	0.65	40 and above	0.87
34-34.9	0.69		

Gray County:

Below 29	$0.50	35-35.9	$0.77
29-29.9	0.54	36-36.9	0.80
30-30.9	0.58	37-37.9	0.83
31-31.9	0.62	38-38.9	0.86
32-32.9	0.66	39-39.9	0.89
33-33.9	0.70	40 and above	0.92
34-34.9	0.74		

Above prices met by Magnolia and The Texas Co. on Oct. 28 in Hutchinson, Carson and Gray counties.

Wheeler County: Posted by Magnolia Pet. Co. Effective Apr. 10. Humble withdrew Wheeler county postings Apr. 10.

Below 30	$0.755	37-37.9	$1.11
30-30.9	0.805	38-38.9	1.145
31-31.9	0.855	39-39.9	1.18
32-32.9	0.905	40-40.9	1.215
33-33.9	0.955	41-41.9	1.25
34-34.9	1.005	42-42.9	1.285
35-35.9	1.04	43-43.9	1.32
36-36.9	1.075	44 and above	1.355

WEST TEXAS and NEW MEXICO

Humble Oil & Refining Co.

Effective Oct. 28, 1930

Crane, Upton, Crockett, Ector, Howard and Glasscock Counties, Tex., also Lea County, N. Mex.

Below 25	$0.50	31-31.9	$0.64
25-25.9	0.52	32-32.9	0.66
26-26.9	0.54	33-33.9	0.68
27-27.9	0.56	34-34.9	0.70
28-28.9	0.58	35-35.9	0.72
29-29.9	0.60	36 and above	0.74
30-30.9	0.62		

Winkler and Pecos counties, Tex.:

Effective Oct. 28, 1930

Below 25	$0.55	31-31.9	$0.69
25-25.9	0.57	32-32.9	0.71
26-26.9	0.59	33-33.9	0.73
27-27.9	0.61	34-34.9	0.75
28-28.9	0.63	35-35.9	0.77
29-29.9	0.65	36 and above	0.79
30-30.9	0.67		

Oct. 28, 1930, The Texas Co. same prices in Crane, Upton, Winkler and Lea counties as Humble.

Oct. 28, Magnolia same prices in Winkler, Crane, Upton, Howard, Glasscock and Mitchell counties.

SOUTH and SOUTHWEST TEXAS

(Posted by Humble Oil & Refining Co.)

Effective Oct. 28, 1930

Mirando	$0.75
Salt Flat	0.90
Darst Creek	0.90
Pettus, Bee County	1.10

NORTH LOUISIANA—ARKANSAS FIELDS

Prices of Standard Oil Co. of Louisiana

Caddo, Homer, Haynesville, Bull Bayou, El Dorado, Crichton, De Soto, Sabine, Cotton Valley, Sarepta and Carterville.

Effective Oct. 30, 1930

Below 29	$0.65	35-35.9	$0.92
29-29.9	0.69	36-36.9	0.95
30-30.9	0.73	37-37.9	0.98
31-31.9	0.77	38-38.9	1.01
32-32.9	0.81	39-39.9	1.04
33-33.9	0.85	40 and above	1.07
34-34.9	0.89		

Smackover, all grades	$0.70
Bellevue (Oct. 30)	1.00
*Urania, La. (Oct. 30, 1930)	0.75
†East El Dorado (Calion) (Oct. 30)	0.70

*Posted by Louisiana Oil Refining Corp.
†Posted by Magnolia Petroleum Co.

Oct. 28, 1930, The Texas Co. same schedule in Louisiana as Standard.

Oct. 30, Magnolia met Standard schedule in Louisiana-Arkansas fields except it posts the same low grades in La.-Ark. as in Mid-Continent.

STEPHENS, ARKANSAS

Louisiana Oil Refining Corp., and Atlantic Oil Producing Co.

Effective Oct. 30, 1930

Below 29	$0.54	31-31.9	$0.66
29-29.9	0.58	32 and above	0.70
30-30.9	0.62		

GULF COASTAL

Posted by Humble Oil & Refining Co.

Effective Oct. 28, 1930

Grades A	$1.00	32-32.9	$1.06
Grades B:		33-33.9	1.08
Below 25	0.75	34-34.9	1.10
25-25.9	0.92	35-35.9	1.12
26-26.9	0.94	36-36.9	1.14
27-27.9	0.96	37-37.9	1.16
28-28.9	0.98	38-38.9	1.18
29-29.9	1.00	39-39.9	1.20
30-30.9	1.02	40 and above	1.22
31-31.9	1.04		

On Oct. 28, The Texas Co. posted same prices on Grades A and B Gulf Coast crude as Humble.

Fields classified as A and B are Spindletop, Goose Creek, Hull, Liberty, Sour Lake, West Columbia, Orange, Boling, Humble, Pierce Junction, Sugarland, Refugio county, and Raccoon Bend. All other fields are Grades A only.

Specifications for Grade "A" crude: Gravity: 25° and below, at 60° F; Viscosity: not less than 100 seconds at 100° F. Saybolt.
Sulfur: not over .4%.

Grade "B" includes all Coastal crude which does not meet the test for "A" grades.

Crude Price Changes

LOUISVILLE—On Nov. 10 Stoll Oil Refining Co. reduced Oil City, Ky. crude 10 cents, making new price $1.00 per barrel.

Manual on Refinery Waste Issued

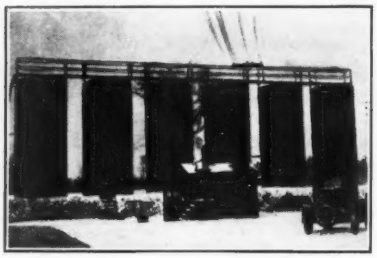
NEW YORK, Nov. 10.—The first edition of the manual on disposal of refinery wastes will be published shortly by the American Petroleum Institute.

It concerns the disposal of waste water containing oil, the sources of oil in waste water, methods and devices for handling waste water and removing oil, recommended good practice, equipment and facilities, the pollution of surface waters by oil, waste water separators, waste water emulsions and sampling and testing waste water for oil.

Three other sections to be published later will cover waste gases and vapors; waste water containing chemicals and waste water containing solids.

WASHINGTON—Berths for three tankers have been completed at Suez harbor by the government of Egypt. These will handle principally crude from the Far Eastern properties of the Shell company. Such crude was formerly pumped from Port Toufick to Suez through a pipeline.

WASHINGTON—Gasoline sales in Quebec gained 15,000,000 imperial gallons for the 12 months ended July 1 this year, over the preceding year. Total sales were 81,000,000 imperial gallons, compared with 66,000,000 gallons.



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New York, Boston, Philadelphia, Louisville, Atlanta, Houston, New Orleans

Crude Oil Prices (in Effect Nov. 10, 1930)

(Prices are per barrel at the well)

(Crude Oil Prices for the whole year in OIL PRICE HANDBOOK published annually)

ROCKY MOUNTAIN FIELDS

Prices of Ohio Oil Co., and Midwest Refining Co.

(Salt Creek prices effective Oct. 27, 1930)

Salt Creek 29-29.9	$0.69
" " 30-30.9	0.73
" " 31-31.9	0.77
" " 32-32.9	0.81
" " 33-33.9	0.85
" " 34-34.9	0.89
‡Salt Creek 35-35.9	$0.92
" " 36-36.9	0.95
" " 37 and above	0.98
Elk Basin	1.25
Grass Creek light	1.25
Big Muddy	1.00
Lance Creek	1.33
Rock Creek	1.01
Mule Creek	1.20
Rex Lake	1.10
Pondera	1.45
‡Osage	1.00
‡Cat Creek, Mont.	1.25
Sunburst, Mont.	1.55
‡Hogback, N. Mex.	1.40
Artesia, N. Mex.	0.75

‡Posted by Midwest Refining Co. Midwest also buys Grass Creek light and Elk Basin.

CALIFORNIA

Standard Oil Co. of California

(Effective Sept. 15, 1930)

Gravity	Signal Hill Seal Beach Alamitos Heights Huntington Beach Inglewood* Olinda-Brea Canon*	Athens Rosecrans Dominguez	Elwood Terrace	Torrance Richfield	Whittier La Habra	Montebello	Coyote	Santa Fe Springs	Newhall McKittrick Kern River	Midway-Sunset Elk Hills Buena Vista Hills Lost Hills	Coalinga	Wheeler Ridge	‡Kettleman Hills	Orcutt (Santa Maria) (Union Oil Co.)	Santa Paula (Ventura) (Union Oil Co.)	Ventura Avenue (Associated Oil Co.)
14-14.9**	$0.70	....	....	$0.70	$0.70	$0.70	$0.70	....	$0.55	$0.55	$0.55	$0.55	....	$0.55	$0.70	$0.70
15-15.9	.70	....		.70	.70	.70	.70	....	.55	.55	.55	.55	....	.55	.70	.70
16-16.9	.70	....		.70	.70	.70	.70	....	.55	.55	.55	.55	$1.65	.55	.70	.70
17-17.9	.70	....		.70	.70	.70	.70	....	.55	.55	.55	.55	for	.55	.70	.70
18-18.9	.76	....		.76	.76	.71	.76	....	.55	.62	.62	.62	55°	.65	.75	.76
19-19.9	.82	....	F.o.b. ships	.82	.82	.77	.82	....	.55	.70	.70	.70	gravity	.70	.80	.82
20-20.9	.88	....		.88	.87	.83	.87	....	....	.78	.78	.78	and	.78	.85	.88
21-21.9	.94	....		.94	.93	.90	.93	$0.92	....	.86	.86	.86	over	.90	.90	.91
22-22.9	1.00	....	....	1.00	.98	.97	.98	.95	....	.94	.94	.94	....	.95	.97	.94
23-23.9	1.07	....	....	1.07	....	1.05	1.04	1.01	....	1.02	1.02	1.02	....	1.02	1.05	1.00
24-24.9	1.12	1.12	....	1.12	....	1.08	1.08	1.05	....	1.06	1.04	1.04	....	1.08	1.07	1.05
25-25.9	1.17	1.17	....	1.17	....	1.11	1.12	1.09	....	1.10	1.06	1.06	....	1.11	1.09	1.10
26-26.9	1.22	1.22	....	1.22	....	1.15	1.16	1.13	....	1.14	1.08	1.08	....	1.15	1.12	1.15
27-27.9	1.26	1.27	....	1.26	....	1.19	1.21	1.18	....	1.18	1.11	1.10	....	....	1.16	1.19
28-28.9	1.30	1.32	....	1.30	....	1.23	1.25	1.23	....	1.23	1.15	....	....	....	1.20	1.23
29-29.9	1.34	1.37	....	†1.34	....	1.26	1.29	1.28	....	1.29	1.19	....	....	....	1.24	1.27
30-30.9	1.38	1.42	....	†1.38	....	1.29	1.33	1.33	....	1.35	1.23	....	....	....	1.29	1.31
31-31.9	1.43	1.47	....	....	....	....	....	1.38	....	1.41	1.27	....	....	....	1.34	1.36
32-32.9	1.48	1.52	....	....	....	....	....	1.43	....	1.47	1.31	....	....	....	1.40	1.41
33-33.9	....	1.57	....	....	....	....	....	1.48	....	1.53	1.35	....	....	....	1.46	1.47
34-34.9	....	1.62	1.32	....	....	....	....	1.53	....	††1.59	1.39	....	....	....	....	1.53
35-35.9	....	1.66	1.39	....	....	....	....	1.58	....	††1.65	1.43	....	....	....	....	1.59
36-36.9	....	1.72	1.46	....	....	....	....	1.63	....	....	....	....	....	....	....	....
37-37.9	....	1.78	1.53	....	....	....	....	1.68	....	....	....	....	....	....	....	....
38-38.9	....	1.84	1.60	....	....	....	....	1.73	....	....	....	....	....	....	....	....
39-39.9	....	1.90	1.66	....	....	....	....	1.78	....	....	....	....	....	....	....	....
40-40.9	....	1.96	1.72	....	....	....	....	....	....	....	....	....	....	....	....	....
41-41.9	....	2.02	1.78	....	....	....	....	....	....	....	....	....	....	....	....	....
42-42.9	....	2.08	1.84	....	....	....	....	....	....	....	....	....	....	....	....	....

*Inglewood prices run only to 28.9 gravity; Olinda-Brea Canon to 31.9 gravity.
†Richfield crude only. ††These two grades apply on Lost Hills only.
**Standard does not contract for crude testing below 14 gravity, but pays 45c per barrel when purchased.
‡Union Oil Co.'s prices on Kettleman Hills crude are, effective Sept. 15: 35-39.5, $1.10; 40-44.9, $1.20; 45-49.9, $1.35; 50-54.9, $1.50; and 55 and above $1.65.

REFINERS' and COMPOUNDERS' SUPPLIES

Following are average market prices for materials used by refiners and compounders effective on the date shown.

Refiners' Supplies

	Nov. 10	Nov. 3
Soda Ash light 58% bags, cwt.	$1.32–1.55	$1.32–1.55
Silicate of Soda 60 deg. drums, cwt.	$1.75–1.90	$1.75–1.90
Silicate of Soda 40 deg. tank cars, cwt.	$0.80	$0.80
Silicate of Soda 40 deg. drums cwt.	$1.05	$1.05
Sal Soda wks.	$0.90-1.10	$0.90-1.10
Caustic Soda 76% solid, cwt.	$2.90	$2.90
Sulfuric Acid 60 deg. tank cars, f. o. b. shipping point per ton	$11.00-12.50	11.00-12.50
Sulfur, flowers of, cwt.	$3.10-4.00	$3.10-4.00
Liquid Chlorine, tank cars, wks., lb.	2.40-2.45	2.40-2.45

Compounders' Supplies

	Nov. 10	Nov. 3
Vegetable Oils		
Linseed carloads, spot, lb.	9.20	9.60
Tanks, spot	8.60	9.00
Soya Bean, Tank, coast, lb.	8.00–9.00	8.00–9.00
Oleic Acid		
Distilled, tanks, lb.	8.00	8.00
Distilled, bbls., lb.	8.875	8.875
Saponified, tanks, lb.	8.50	8.50
Saponified, bbls., lb.	9.375	9.375
Lard Oils		
Prime Winter Strained, lb.	13.75	13.75
Extra Winter Strained, lb.	10.75	10.75
Extra, lb.	10.25	10.25
Extra No. 1, lb.	10.00	10.00
No. 1, lb.	9.25	9.25
No. 2, lb.	9.00	9.00
Tallow oil, lb.	8.75	8.75
Neatsfoot Oil		
Pure, bbls., lb.	11.50	11.50
Extra, bbls., lb.	10.25	10.25
No. 1 bbls., lb.	9.75	9.75
Cold Pressed, lb.	15.50	15.50
Fish Oils		
Menhaden Oil		
Light Pressed, gal.	45–47	45–47
Light Pressed, tank cars, N. Y., gal.	39–42	39–42
Yellow bleached, gal.	42–45	42–45
Whale, extra winter bleached, gal.	85	85
Naval Stores		
Steam, distilled turpentine, N. Y., gal.	41.50–42.50	42–43
Steam distilled turpentine, Savannah, gal.	36.50	40–41
Gum turpentine, N. Y., gal.	45	45
Gum turpentine, f.o.b. cars Savannah, gal.	38.75	38.75
Wood Rosin, N. Y., gal.	$5.15	$5.15
Wood Rosin F, Savn'h, bbl.	$4.66	$4.76
Gum Rosin B, N. Y. bbl.	$5.45	$5.35
Gum Rosin B, f. o. b. cars Savannah, bbl.	$4.20	$4.20
Rosin oil, pure, gal.	56	56
Rosin oil, compounded, gal.	50	50
Pine Tar		
Kiln burnt, bbl.	$13.00-14.00	$13.00-14.00
Retort, bbl.	$13.50-14.50	$13.50-14.50
Alcohol		
Denatured Formula 5, in bbls., per gal.	46–48	46–48

OIL STOCKS AND FINANCES

Two More Companies Report Gain In Net Earnings This Year

CLEVELAND, Nov. 10

LARGER net earnings in the first nine months of 1930 than in the first nine months of 1929 were reported the last week by two of nine oil companies that issued statements covering their income. These companies that increased earnings were the Amerada Corp. and the H. F. Wilcox Oil & Gas Co. The same two companies reported larger earnings for the third quarter than for the third quarter of 1929. Week before last two of 10 companies reporting announced gains in profits this year.

Standard Oil Co. of California issued its first quarterly income statement. It announced that earnings reports will be issued quarterly henceforth. The report, containing summaries of income in 1929 and 1930, shows the first quarter profits this year to have been larger than the first quarter income of 1929 but this year's second and third quarter summaries show smaller earnings this year. The decrease this year and in the first quarter of last year were attributed to severe gasoline price depressions during those periods.

The California company's earnings this year and last after all reserves and federal income taxes were as follows by quarters:

	1929	1930
First quarter	$8,259,076.81	$9,430,224.45
Second quarter	11,849,254.27	10,288,300.11
Third quarter	14,267,149.09	10,717,038.67
Fourth quarter	12,258,009.93	.....

The Standard of California's net income the first nine months this year averaged $2.37 a share on 12,845,980 $25 shares, compared with $2.37 a share on 12,594,098 shares the first nine months of 1929.

Amerada's income the first nine months includes the profit from the sale of a half interest in its Kettleman Hills lease to Union Oil Co. of California. However, before this, its operating income before depreciation and depletion amounted to $3,100,475 as compared with operating income of $2,273,889 in the first nine months of 1929. Last year's total income for the nine months included profit from sale of Mid-Continent producing properties to Dixie Oil Co., subsidiary of Standard Oil Co. of Indiana.

The net this year after reserves and federal income taxes averaged $4.53 a share on 992,075 no par shares, compared with $2.83 a share on the same number of shares outstanding the first nine months of 1929.

General Ashphalt Co.'s earnings averaged $2.03 on 413,333 no par shares which will be outstanding on completion of exchange of no par shares for old $100 par shares. Earnings the first nine months of 1929 figured on the same basis averaged $3.01 a share.

Shell Union Oil Corp's profits this year were derived solely from its pipeline subsidiary. The Shell Pipe Line Corp. earned $11,544,658 after interest and depreciation but before federal income taxes in nine months this year, compared with $10,357,887 in the first nine months last year. This indicates the company lost more than $10,000,000 on its activities this year.

Simms Petroleum Co.'s unsatisfactory showing the third quarter, according to Edward T. Moore, president, was because of further declines in the wholesale and retail prices of gasoline and the continued curtailment of crude oil production.

Mr. Moore reported that the company had a profit and loss surplus of more than $4,000,000 with no funded debt or preferred stock outstanding. He reported current assets Sept. 30 were six times current liabilities.

Skelly Oil Co.'s net in nine months averaged $1.51 a share on 1,099,372 $25 common shares after dividends on the preferred stock. In 1929 the net to common in the corresponding period was $4.40 a share. This year the company just earned its dividend for the nine months with 1 cent a share to spare.

Tide Water-Associated Oil Co. the first nine months averaged 78 cents a share on 5,879,448 no par shares after dividends on preferred stock, compared with $1.17 a share on 5,632,829 shares of common the first nine months of 1929. Its subsidiary, Tide Water Oil Co., netted $1.48 a share on its common this year an $2.09 last year. Its other major subsidiary, Associated Oil Co., netted $2.01 a share this year and $2.32 a share last year.

H. F. Wilcox Oil & Gas Co. averaged $1.67 a share on 428,967 no par shares this year and 98 cents a share in nine months last year.

Vacuum Oil Co. has issued a statement saying its earnings this year have been excellent in view of de-

(*Continued on Page* 300)

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Third Quarter Earnings

Company	1930	1929
Amerada Corp	$3,772,810	$2,259,185
Derby Oil & Refining	218,151	.....
General Asphalt	634,147	783,656
Shell Union	†1,107,659	†9,172,746
Simms Petroleum	*154,760	888,887
Skelly Oil	646,522	1,614,514
S. O. California	10,717,039	14,267,149
Tide Water—Associated	290,887	4,866,672
Associated	1,331,076	2,315,771
Tide Water	1,149,411	2,443,814
H. F. Wilcox Oil	201,925	198,498

*Loss. †Before federal income taxes.

Nine Month Earnings

Company	1930	1929
Amerada Corp	$4,173,871	$2,613,300
Derby Oil & Refining	.....	540,361
General Asphalt	840,827	1,245,416
Shell Union Oil	†826,678	†18,682,405
Simms Petroleum	*195,523	1,306,634
Skelly Oil	1,930,306	4,813,450
S. O. California	30,435,563	34,375,480
Tide Water Associated	7,886,522	9,865,235
Associated	4,596,561	5,312,223
Tide Water	3,988,263	5,344,467
H. F. Wilcox Oil	716,216	421,283

*Loss. †Before federal income taxes.

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Transactions in Oil Shares on New York Stock Exchange

1929 High	1929 Low	1930 High	1930 Low	Listed Shares	Par Value	Company	Div. Rate	Last Paid	Transactions Week Ending Nov. 8 Sales	First	High	Low	Last	Change
42⅝	17½	42¼	20½	922,075	N.P.	Amerada Corp.	50cQ	July 31, 30	3,000	23¼	23¼	22	22	— 1¼
64¾	12½	37	8¼	209,180	N.P.	American Republics Corp.	....	.....	2,600	10½	10⅜	10⅛	10½	+ ⅜
47¼	34½	51	30⅞	2,240,000	$25	Associated Oil	50cQ	Sept. 30, 30	40	33	35	33	35	+ 1⅜
77⅞	30	51⅜	19	2,683,868	25	Atlantic Refining Co.	‡25cQ	June 16, 30	62,000	21⅞	21⅞	†19	19	— 2⅞
49⅜	20	34	14⅛	2,257,108	25	Barnsdall Corp. A	50cQ	Aug. 6, 30	22,100	15	15¾	14⅛	14⅛	— 1⅜
34½	25	35	22	2,060,966	25	California Petroleum Corp.	....	Jan. 1, 29	.....	.....	.....	.....	.....	.....
32⅞	12½	20⅝	9½	1,444,970	N.P.	Colonial Beacon Oil Co.	....	.....	2,600	9½	10	9½	9½	— ½
37¾	18	30½	12	4,610,258	N.P.	Continental Oil (Delaware)	....	.....	52,000	12½	12¾	11⅛	11¼	— 1¼
94¾	42¼	71⅛	30	410,857	$100	General Asphalt Co.	$1Q	Sept. 15, 30	5,200	30¾	30¾	28¼	28¼	— 2⅝
109	26	116⅞	43¼	250,000	100	Houston Oil	....	.....	14,400	45¾	45¾	34¾	34¾	— 8⅝
39⅜	17¾	32	15⅛	1,379,295	N.P.	Independent Oil & Gas	37½c	Oct. 2, 30	36,000	16½	16½	13¼	13⅜	— 2⅞
53	13½	28⅜	3¼	699,066	10	Indian Refining	....	Dec. 15, 20	145,200	4½	4⅞	4	4⅛	+ ⅛
51¼	11½	27¾	8⅛	568,816	10	do certificates	....	.....	.....	.....	.....	.....	.....	.....
38⅜	16½	29½	21¼	3,994,150	N.P.	Lago Oil & Transport	....	Aug. 2, 27	.....	.....	.....	.....	.....	.....
18	7	12	4⅝	1,187,701	N.P.	Louisiana Oil Refining	....	.....	4,900	6	6	5¼	5¼	— ⅝
100¼	80	89½	78⅜	40,000	$100	do pfd.	$1.62½Q	Aug. 15, 30	.....	.....	.....	.....	.....	.....
18½	5⅞	10⅜	2	330,000	N.P.	Maracaibo Oil Exploration	....	.....	200	2½	2½	2⅛	2⅛	— ⅜
295	176	182	150	459,428	$100	Mexican Petroleum	$3Q	July 31, 30	.....	.....	.....	.....	.....	.....
105	102	..	..	120,000	100	do pfd.	$2Q	July 31, 30	.....	.....	.....	.....	.....	.....
69⅜	9¼	37	11⅝	1,244,383	N.P.	Mexican Seaboard Oil	....	Oct. 15, 24	39,500	14½	14½	†11⅝	11⅝	— 2⅞
39⅞	22⅛	33	17	1,899,138	N.P.	Mid-Continent Petroleum	50cQ	Aug. 1, 30	9,300	17¾	18½	†17	17	— 1
3⅝	¾	2½	¾	908,171	N.P.	Middle States Oil ctfs.	....	.....	.....	.....	.....	.....	.....	.....
..	..	32	17	6,708,086	N.P.	Ohio Oil Co.	50cQ	Sept. 15, 30	68,300	20¼	21½	18⅛	18½	— 2¼
69	40¼	64¼	45¾	1,000,000	$50	Pan American Petrol. & Trans.	....	Oct. 20, 27	900	45⅜	46¼	†45¾	45¾	— 1⅝
69¼	40½	67½	45	2,422,221	50	do B	....	Oct. 20, 27	4,000	47	47	†45	45	— 1⅝
15¼	3	12¾	2⅛	199,370	N.P.	Panhandle Prod. & Refg.	....	.....	.....	.....	.....	.....	.....	.....
76	47½	80	47½	25,666	$100	do pfd.	....	July 2, 23	.....	.....	.....	.....	.....	.....
..	..	27½	10½	2,937,900	N.P.	Petroleum Corp. of America	37½cQ	Sept. 30, 30	24,800	11⅛	11⅜	†10½	11⅛	+ ⅛
47	24¼	44⅜	18⅝	2,670,089	N.P.	Phillips Petroleum Co.	50cQ	Oct. 2, 30	41,500	21¾	22	†18⅝	18⅝	— 3¼
3⅜	1	2½	¾	1,184,917	$25	Pierce Oil Corp.	....	.....	2,000	⅞	⅞	⅞	⅞	— ⅛
51½	20	52	15¼	150,000	100	do pfd.	....	Feb. 1, 22	100	15¼	15¼	†15¼	15¼	+ ¼
5⅞	½	7⅛	2¼	2,500,000	N.P.	Pierce Petroleum Corp.	....	.....	3,400	2¾	3	2⅝	2⅝	— ⅛
65⅜	40½	54	21	2,435,670	$25	Prairie Oil & Gas Co.	50cQ	Sept. 30, 30	6,600	21¼	22	†21	21	— ⅞
65	45	60	26⅝	4,050,000	25	Prairie Pipe Line Co.	‡75cQ	Sept. 30, 30	3,500	27¾	29	†26⅝	27	+ ⅞
25⅞	4	31	3⅜	749,017	50	Producers & Refiners Corp.	....	Sept. 15, 30	2,200	4¼	4¼	†3⅜	3⅜	— ⅜
46⅜	25½	38	21	56,907	50	do pfd.	....	May 4, 25	.....	.....	.....	.....	.....	.....
30¾	20	27¼	10¾	3,038,370	25	Pure Oil Co.	37½cQ	Sept. 1, 30	22,500	12¼	12⅝	11¼	11¼	— 1¼
116	108	114¼	100	130,000	100	do 8% pfd.	$2Q	Oct. 1, 30	330	104¾	104¾†	100	100½	— 4¼
49⅜	22⅝	28¼	6	2,891,735	25	Richfield Oil (California)	50cQ	Sept. 1, 30	19,400	6⅝	6¾	6¼	6¼	— ⅝
42½	15	25¾	7⅛	1,235,270	N.P.	Rio Grande Oil Co.	50cQ	July 25, 30	10,200	8¾	8¾	7⅝	7⅞	— ⅝
64	43⅛	56½	42⅞	951,310	$13.40	Royal Dutch (N. Y. shares)	$1.875	Aug. 13, 30	17,300	44¼	44½	†42⅞	43¼	— 1¼
55¾	43⅜	48⅜	37½	77,492	L2	Shell Trans. & Trading	$1.453	July 28, 30	10	38⅛	38⅛	38⅛	38⅛	— ⅞
31⅜	19	25½	9⅛	13,069,076	N.P.	Shell Union Oil Corp	35cQ	June 30, 30	19,200	10⅞	10⅞	†9½	9⅛	— 1⅞
..	..	106¼	69	400,000	100	do pfd.	$1.37½Q	Oct. 1, 30	2,500	74	74	†69	69¾	—10¼
40⅛	15	37	7⅞	869,255	10	Simms Petroleum Co.	40cQ	June 14, 30	14,500	9¾	9¾	†7⅞	7⅞	— 1⅝
45	21	32	12½	5,455,665	N.P.	Sinclair Consolidated Oil Corp.	50cQ	July 15, 30	51,900	13⅞	14⅛	†12½	12½	— 1⅜
111	103	112¼	106½	154,685	100	do pfd.	$2Q	Aug. 15, 30	100	107¾	107¾	107¾	107¾	0
46½	42	42	10¼	1,097,650	$25	Skelly Oil Co.	50cQ	Sept. 15, 30	9,100	17¾	17¾	†10¼	10¼	— 7¾
..	..	99¾	69	120,000	100	do pfd.	$1.50Q	Aug. 1, 30	500	70½	71	†69	69	— 2½
..	..	106	98	750,000	100	S. O. Export Corp. pfd.	$2.50S.A.	June 30, 30	1,100	102	104¾	102	104	+ 2
81⅛	51½	75	50½	13,016,434	N.P.	S. O. California	62½cQ	Sept. 15, 30	26,100	51½	51⅞	†50½	50¾	— ½
..	..	49	18¾	320,000	$25	S. O. Kansas	50cQ	Sept. 15, 30	2,300	20	20¼	†18¼	19	— ½
83	48	84⅛	50¾	25,443,643	25	S. O. New Jersey	‡25cQ	Sept. 15, 30	107,200	54	54	†50¾	51	— 2¾
48⅛	31⅝	40¾	25½	17,809,530	25	S. O. New York	40cQ	Sept. 15, 30	37,500	26⅞	27	25½	25¾	— 1⅛
86⅜	55	70	50	1,416,911	N.P.	Sun Oil Co.	25cQ	Sept. 15, 30	3,000	52⅛	53	50	50	— 3⅛
105½	100	107¾	102⅛	100,000	$100	do pfd.	$1.50Q	Sept. 1, 30	50	..	107	106¼	106½	+ ¼
24	5¼	9⅜	1¼	1,026,979	N.P.	Superior Oil Corp.	....	.....	2,100	1½	1¾	†1¼	1¼	— ¼
71⅞	50	60½	37⅝	9,850,724	$25	The Texas Corp.	75cQ	Oct. 1, 30	46,800	39⅞	40	†37⅝	37⅝	— 2⅝
23⅞	9½	14½	5½	929,947	10	Texas Pacific Coal & Oil	s2½%	Dec. 31, 29	7,200	5⅝	5¾	5½	5½	0
23½	10	17¾	8¾	5,881,980	N.P.	Tide Water Associated Oil	30cS.A.	Aug. 15, 30	64,000	9⅞	10	†8¾	9	— 1
90⅞	74⅜	89¾	70	732,550	$100	do pfd.	$1.50Q	Oct. 1, 30	600	70	72¼	70	70	— 2½
40	14	31	15⅜	2,191,820	N.P.	Tide Water Oil Co.	20cQ	Sept. 30, 30	.....	.....	.....	.....	.....	.....
97½	85⅛	94⅞	82	199,443	$100	do pfd.	$1.25Q	Aug. 15, 30	800	82	85½	†82	82	— 3
..	..	24	12⅛	3,339,150	N.P.	Transcontinental Oil	30c	May 1, 30	.....	.....	.....	.....	.....	.....
57	42⅛	50	27⅛	2,201,008	$25	Union Oil Co. (California)	‡50cQ	Aug. 9, 30	8,900	29½	29½	†27⅛	27½	— 1½
..	..	38½	24	1,254,048	N.P.	Union Tank Car Co.	40cQ	June 2, 30	11,400	25	26	†24	25	0
42⅞	15	27	6½	777,603	N.P.	Warner Quinlan Co.	25cQ	July 3, 30	7,200	6½	6¾	6½	6½	0
38	25	29½	26	490,000	N.P.	White Eagle Oil & Refg.	50cQ	Apr. 20, 30	.....	.....	.....	.....	.....	.....
29¾	12⅜	21	9⅜	428,967	N.P.	Wilcox Oil & Gas Co.	....	May 10, 28	2,600	10	10	9½	9½	— ½

*New high †New low ‡Also extra s-Stock Total sales 1,052,730

Pittsburgh Stock Exchange

Transactions Week Ended Nov. 7, 1930

	Sales	High	Low	Last	Change
Ark. Nat. Gas	1,050	7¼	7	7	— ¾
do pfd.	1,829	7¾	7½	7¾	+ ⅛
Devonian Oil	125	7½	7	7½	+ ½
Leonard Oil	150	1	1	1	0
Lone Star Gas	15,827	25¼	23¼	23¼	—1½
do pfd.	10	106	106	106	— ½
Plymouth Oil	500	21	†20	20	—2
Pet. Exploration	110	25	24	25	0
Shamrock O. & G.	1,650	13	11	11	—1

Pittsburgh Curb Market

Transactions Week Ended Nov. 7, 1930

	Sales	High	Low	Last	Change
Arkansas Gas A	250	7¼	7	7	— ½

†New low.

Two More Companies Report Gain in Net Earnings This Year

(*Continued from Page* 298)

pressed worldwide conditions.

"As far as can be seen," the Vacuum statement said, "the company will have at the end of this year a substantial amount of the year's earnings to add to its surplus after the payment of its dividends."

Sales of the Standard Oil Co. of New York in the first nine months of 1920 were the largest in the company's history, President Charles F. Meyer recently told the Socony Twenty-Year Club in New York.

"In this period," Mr. Meyer is quoted as saying, "the operating results plus the non-recurring profit in the sale of certain gas properties, made a total which exceeded any former earnings and exceeded also the dividend requirements. At the same time the company has cash and marketable securities amounting to more than $45,000,000."

The gas properties referred to were those of the Magnolia Gas Co.

Aviation Gasoline Prices

(*Continued from page 293*)

S. O. NEBRASKA

	T.W.	Tax	T.W.
Omaha	16.25	4	20.25

2c per gal. refund to resellers.

CONTINENTAL OIL CO.

*Denver, Col.	15	4	19
Cheyenne, Wyo.	17	4	21
Helena, Mont.	23.5	5	28.5
Salt Lake City, Utah.	19.5	3.5	23
†Albuquerque, N. M.	15	5	20
Boise, Ida.	21.5	5	26.5

*1c per gal. discount to dealers at Denver. †2c per gal. discount to dealers at Albuquerque.

S. O. CALIFORNIA

Phoenix, Ariz.	17	4	21
Los Angeles, Cal.	19.5	3	22.5
San Francisco, Cal.	20	3	23
Reno, Nev.	24	4	28
Portland, Ore.	19.5	4	23.5
Seattle, Wash.	19.5	3	22.5
Spokane, Wash.	23.5	3	26.5

4c per gal. discount off t.w. price of gasoline to customers taking tank truck delivery, through S. O. California territory, except 1c discount at Phoenix.

Four Companies to Pay Extra Last Quarter

CLEVELAND, Nov. 10.—Extra or special dividends were declared the last week by the Imperial Oil, Ltd., subsidiary of Standard Oil Co. (N. J.), the Standard of New Jersey, Standard Oil Co. of California and Vacuum Oil Co.

The Imperial's special was 50 cents a share. This will bring the company's payments for 1930 to $1 a share. Last year it paid the equivalent of 50 cents a share on the present no par value stock. The company said this dividend was not to be regarded as an extra.

The New Jersey's extra is 25 cents a share, the same as it has paid each quarter this year.

The Vacuum's is 25 cents a share. This is the first extra this company has paid this year. It brings the total 1930 payments to the 1929 level of $4.25 a share.

The California company's payment of stock is the same rate as paid a year ago. This year's stock payment will require about 256,920 shares. Scrip or fractional shares will not be paid, but those entitled to fractional shares will be paid cash at the rate of the average price of the Standard of California stock on the New York Stock Exchange Nov. 15.

Standard Oil Co. of Nebraska has omitted for the fourth quarter the 25-cent extra it has paid the preceding quarters of 1930.

Pure Explains Why It Omitted Dividend

CHICAGO, Oct. 31.—In explaining why it omitted its dividend on its common stock due at this time, Pure Oil Co. issued this statement:

"Although the Van Zandt field, in Van Zandt County, Texas, of which the company owns 80 per cent, was developed and put into production this year, the company was not able to utilize more than a small percentage of its possible production on account of proration, both voluntary and compulsory.

"It was during this time obliged to carry on development of the field, which is now rated as one of the three or four largest in the United States. Operation of the pipeline facilities which it has built and in which it has acquired an interest this year will not be fully productive until next spring.

"In view of the general state of the industry and the above consideration, it was felt that it was the prudent course to conserve its resources until it was in position to take advantage of the added production and pipeline facilities, and until conditions in the industry improved."

THE OIL INDUSTRY EXCHANGE

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FOR SALE: HALF INTEREST IN BULK OIL STATION. Located in good tractor territory on hard road. Doing nice business. Would sell all to oil or refinery company and run place on commission. Address Farmers' & Merchants' Oil Company, Box 226, Bethany, Ill.

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Standard Oil Stocks on New York Curb

1929 High	1929 Low	1930 High	1930 Low	Outstanding Shares	Par Value	Companies	Div. Rate	Last Paid	Transactions Week Ended Nov. 8 Sales	First	High	Low	Last	Change
18¾	13½	18½	12¼	.....	£1	Anglo-Amer. Oil voting stk. ctfs..	36c	June 5, 29	.....	....	....	....	....	.....
17⅛	11	19	12	.....	£1	do non-voting stk. ctfs.....	36c	June 5, 29	.....	....	....	....	....	.....
2½	¾	1	⅝	500,000	N.P.	Atlantic Lobos Oil.....	....	.....	.....	....	....	....	....	.....
4⅛	1	1½	½	200,000	$50	do pfd.....	....	.....	.....	....	....	....	....	.....
46½	25	25	11¾	40,000	25	Borne Scrymser Co.....	$1S.A.	Apr. 15, 30	.....	....	....	....	....	.....
74¼	55	69	49	200,000	50	Buckeye Pipe Line Co.....	$1Q	Sept. 15, 30	.....	....	....	....	....	.....
210	130	184⅞	118¼	120,000	25	Chesebrough Mfg. Co.....	‡$1Q	Sept. 30, 30	.....	....	....	....	....	.....
11⅛	5⅝	7⅝	3⅞	.....	N.P.	Creole Petroleum Co.....	....	.....	13,200	4⅛	4⅛	3⅞	4	0
75¾	40	65¾	25	30,000	$50	Cumberland Pipe Line Co.....	$1Q	June 16, 30	.....	....	....	....	....	.....
70½	42	54¾	31¾	50,000	100	Eureka Pipe Line Co.....	$1Q	Aug. 1, 30	.....	....	....	....	....	.....
...	...	6¾	2½	280,000	N.P	Galena Oil Corp. w.i.....	....	.....	200	3	3	3	3	— ½
...	...	37¼	26	.....	N.P.	General Petroleum Corp. w.i.....	....	.....	400	26	26	†26	26	— 2
128	74⅛	119	71	2,974,645	$25	Humble Oil & Refg. Co.....	50cQ	Oct. 1, 30	4,700	72⅜	72⅞	†71	71	— 1⅜
41	22	30	15⅞	26,490,741	N.P.	Imperial Oil, Ltd.....	12½cQ	June 2, 30	20,800	17	19¾	17	17	+ ⅛
42⅛	26	41	24	300,000	$10	Indiana Pipe Line Co.....	‡50cQ	Aug. 15, 30	400	26½	26½	†24	24	— 2½
29⅜	15	24	13¾	14,247,880	N.P.	International Petroleum Co.....	25c	June 16, 30	9,400	14⅜	15	14⅛	14⅛	0
25⅞	10⅛	22⅜	13¾	509,000	$12½	National Transit Co.....	25cQ	June 16, 30	800	14½	14½	14	14⅛	— ⅛
17¾	10	21	10⅛	100,000	10	New York Transit Co.....	40cQ	July 15, 30	400	14½	15½	14	15½	+ 1½
63	41	54	30⅛	40,000	50	Northern Pipe Line Co.....	$2S.A.	July 1, 30	.....	....	....	....	....	.....
105⅛	103⅜	108	103	600,000	100	Ohio Oil pfd.....	$1.50Q	June 14, 30	100	105⅜	105⅜	105⅜	105⅜	+ ¼
44½	18⅝	32	17	400,000	25	Penn Mex. Fuel Co.....	$1	May 20, 30	1,400	18½	18½	17	17	— 2
50	29	33	7¾	160,000	25	Solar Refining Co.....	$1.25S.A.	Dec. 20, 29	100	8½	8½	8½	8½	+ ½
23½	13	20⅛	9	100,000	10	Southern Pipe Line Co.....	$5	Sept. 2, 30	.....	....	....	....	....	.....
60¼	35⅛	45⅞	25	1,200,000	25	South Penn Oil Co.....	50cQ	Sept. 30, 30	800	27½	27½	25	25	— 1½
70	45	64	39	35,000	50	Southwest Pa. Pipe Lines.....	$1Q	Oct. 1, 30	.....	....	....	....	....	.....
63	45	59⅞	38⅝	16,850,587	25	S. O. Indiana.....	62½cQ	June 16, 30	32,300	40½	40¾	†38¾	38¾	— 1⅝
46⅞	29	40½	22⅛	2,577,124	10	S. O. Kentucky.....	40cQ	June 30, 30	9,100	24⅞	25	†22⅛	22¾	— 2⅛
50¼	40	48⅞	39	188,159	25	S. O. Nebraska.....	‡62½cQ	June 20, 30	5,100	41¼	41½	†39	39	— 2
129	60	108½	52⅞	560,000	25	S. O. Ohio.....	62½cQ	Oct. 1, 30	300	56¾	56¾	54	55	0
...	...	...	...	120,000	100	do 5% pfd.....	....	.....	500	103	103⅜	103	103⅜	+ ⅜
124½	113½	122	115¼	70,000	100	do 7% pfd.....	$1.75Q	Sept. 2, 30	740	116⅞	117	116	116	— ⅞
18	5⅛	10	4	34,158	25	Swan Finch Oil Corp.....	....	Jan. 15, 29	.....	....	....	....	....	.....
133¾	75⅛	97⅞	59⅛	5,139,887	25	Vacuum Oil Co.....	$1Q	June 20, 30	13,300	61¼	62½	60	61⅛	+ ⅛

•New high †New low ‡Also extra

Independent Oils on New York Curb

1929 High	1929 Low	1930 High	1930 Low	Par Value	Companies	Transactions Week Ended Nov. 8 Sales	First	High	Low	Last	Change
.72	⅛	⅜	1/32	$1	Amer. Contr. Oilfields	.....	....	....	....	....	.....
8⅛	1⅛	4½	1	5	Amer. Maracaibo.....	500	1	1⅛	1	1	— ⅛
4¾	1	1⅜	1⅛	10	Argo Oil.....	.....	....	....	....	....	.....
26	3⅜	16¾	5⅛	N.P.	Arkansas Nat. Gas...	3,000	7⅜	7⅜	†5⅛	5⅛	— 2
24¾	6½	16⅜	4⅝	N.P.	do Class A.....	14,700	7⅛	7½	†4⅝	5½	— 2
9	4	8⅛	7½	10	do pfd.....	700	7¾	7⅞	7½	7½	— ¼
70	50	28½	15¼	N.P.	British American Oil..	.....	....	....	....	....	.....
4⅞	⅞	2¾	¾	¼	Carib Syndicate.....	1,100	1¼	1¼	1⅜	1⅜	— ¼
68½	20	44¼	16	N.P.	Cities Service.....	134,900	23¾	24⅛	†16	17	— 6¾
99¼	84	93⅞	52	100	do pfd.....	1,400	90½	90⅞	88½	88½	— 2
9¼	8	9	7⅝	10	do pref. B.....	300	8¼	8¼	7¾	7¾	— ½
96	81	89⅞	80	100	do pref. BB.....	100	80	80	†80	80	— 3
1½	⅛	1/32	⅛	1	Colombia Syndicate..	8,100	1/32	1/32	1/32	1/32	— 1/32
15	3⅞	8¼	2⅝	N.P.	Colon Oil Corp.....	800	2¾	2⅞	2½	2½	— ½
...	...	21	5¾	N.P.	Columbia Oil & Gas..	8,500	8	8⅛	7	7⅛	— ⅞
11⅛	2½	5⅛	2	10	Consolidated Royalty	400	2⅞	2⅞	2¾	2¾	— ⅛
135	42	74¾	5¼	N.P.	Cosden Oil Co.....	14,800	5½	5½	2¾	3	— 2½
87	55	70	15½	100	do pfd.....	.....	....	....	....	....	.....
2½	¼	1	¼	N.P.	Crown Central Pet...	300	¼	⅜	¼	¼	— ⅛
11¼	4	...	...	N.P.	Crystal Oil.....	.....	....	....	....	....	.....
51⅛	51⅛	...	...	100	do pfd.....	.....	....	....	....	....	.....
26	6½	13½	5¼	N.P.	Darby Petroleum.....	2,400	7	7	†5¼	5¼	— 2
...	...	21¾	21½	N.P.	do new.....	.....	....	....	....	....	.....
11	2	11	4½	N.P.	Derby Oil & Refg.....	400	5	5	5	5	0
44	17	60	30	N.P.	do pfd.....	.....	....	....	....	....	.....
...	...	12	12	10	Devonian Oil.....	.....	....	....	....	....	.....
209	115	166⅞	75¼	$25	Gulf Oil Corp.....	2,800	79⅛	80½	†75¼	76	— 4
7½	1⅛	4	2¼	N.P.	Homaokla Oil.....	.....	....	....	....	....	.....
...	...	47½	18½	N.P.	Indian Territory A...	3,700	22½	22½	†18½	18½	— 4
...	...	53½	18⅝	N.P.	do B.....	800	22¼	22¼	†18⅝	18⅝	— 3⅝
2⅞	⅜	1¾	⅜	10	Intercontinental Pet..	3,200	⅜	½	⅜	⅜	— ⅛
3⅝	1¼	3	1½	N.P.	Kirby Petroleum.....	.....	....	....	....	....	.....
6⅛	1	4¾	¾	N.P.	Leonard Oil & Dev...	5,200	1	1	†¾	¾	— ¼
38⅞	18	29	6¼	N.P.	Lion Oil Refg.....	9,900	10⅞	10⅞	†6¼	7⅞	— 1⅜
67⅞	28	55⅞	22¾	N.P.	Lone Star Gas.....	14,400	25¾	25¾	†22¾	22¾	— 1¾
...	...	31	5½	$25	MacMillan Petrol....	.....	....	....	....	....	.....
2⅞	¼	½	⅛	1	Magdalena Synd.....	1,800	⅛	⅛	⅛	⅛	0
38½	14	16	6	N.P.	Margay Oil.....	.....	....	....	....	....	.....
6⅜	2¼	7½	1⅞	N.P.	Mexico Ohio Oil.....	1,400	2⅛	2⅛	†1⅞	1⅞	— ⅛
...	...	11⅞	3	N.P.	Middle States A v.t.c.	2,100	3	4	3	3	0
...	...	6	1	N.P.	do Class B v.t.c...	900	1⅛	1⅛	†1	1⅛	0
42	8	36¼	7⅝	5	Missouri-Kansas P.L.	8,600	9½	10¼	8¼	8¼	— 1¼
1½	¼	¾	⅜	1	Mountain & Gulf Oil..	900	⅜	⅜	⅜	⅜	0
22⅞	7	12⅛	5⅝	10	Mountain Producers..	1,800	6⅜	6⅜	†5⅝	5⅝	— ½
43⅞	24	41⅜	25⅛	N.P.	Nat. Fuel Gas.....	4,800	27⅝	27⅝	26	26	— 2⅜
5	2¼	3½	1⅞	$5	New Bradford Oil...	700	2	2	†1⅞	2	0
4¾	3⅛	3⅛	2⅜	10	New England Fuel...	.....	....	....	....	....	.....
24½	11⅛	16⅞	4	25	N. Y. Pet. Royalty...	.....	....	....	....	....	.....
18½	6⅛	11¼	3	N.P.	North Central Texas	300	4	4	3¾	3¾	0
19¾	8⅛	11⅝	5½	N.P.	Oilstocks Ltd. A.....	400	5⅞	5⅞	†5½	5½	— ¼
18¾	8½	11½	6	N.P.	do B.....	3,000	6½	6½	†6	6	— 2⅜
26⅝	12⅛	19½	10	N.P.	Pacific Western Oil...	1,100	12	12	†10	10	— 2
3½	½	2½	1/16	N.P.	Pandem Oil.....	3,800	3/16	3/16	¼	1/16	0
10½	2¼	4⅜	1¾	N.P.	Pantepec Oil.....	400	2⅛	2⅛	1⅞	1⅞	— 3/16
25½	13⅛	15	13½	$25	Paragon Refg. B. ctfs.	.....	....	....	....	....	.....
28	17	29	19⅜	N.P.	Petroleum Corp.....	.....	....	....	....	....	.....
...	...	5⅞	1	....	do warrants.....	400	1	1	1	1	0
37	22	27½	19½	N.P.	Plymouth Oil.....	1,500	21⅜	21⅜	†19½	19½	— ⅜
16	9	10½	6	$5	Red Bank Oil.....	.....	....	....	....	....	.....
8⅛	1⅛	5⅜	1⅝	N.P.	Reiter-Foster Oil....	1,600	2	2	†1⅝	1⅝	— ½
25¼	19	23½	9¾	25	Richfield Oil pfd....	1,000	14⅜	14½	13½	13¾	+ ⅜
29	13	25	5	N.P.	Root Refining pr. pfd.	.....	....	....	....	....	.....
11	3	8⅛	2	N.P.	Ryan Consolidated...	700	2½	2½	†2	2	— ⅛
5⅞	1⅞	2½	1⅜	10	Salt Creek Consol....	.....	....	....	....	....	.....
25⅞	9	15¼	6⅜	10	Salt Creek Producers.	1,800	7¼	7½	†6⅜	6⅜	— ¾
33⅛	10	8	5⅝	25	Shreveport El Dorado	.....	....	....	....	....	.....
...	...	39⅛	39	25	Signal Oil & Gas A...	.....	....	....	....	....	.....
24	9	17	7	N.P.	Southland Royalty...	7,200	7	8	†7	7⅜	+ ⅛
12	4	10	3¾	5	Sunray Oil.....	8,100	3⅞	4⅞	3¾	3⅞	+ ⅛
23	7⅛	19½	8⅜	N.P.	Texon Oil & Land....	400	10¼	10¼	10¼	10¼	— ¼
81⅛	8⅞	16	8	10	Venezuela Mexico....	.....	....	....	....	....	.....
6½	1⅛	4½	1¼	5	Venezuela Petroleum.	5,300	1½	1⅝	†1¼	1½	— ¼
9⅛	2	5	2	1	Woodley Petroleum..	.....	....	....	....	....	.....
5⅜	¼	2½	⅜	N.P.	Y Oil & Gas.....	600	½	½	†⅜	⅜	0

•New High †New Low

New York Bonds

Week Ending Nov. 7

	High	Low	Last	Change
Assoc. Oil gold 6s.....	103	102¾	103	+ ⅜
Atlantic Refg. deb. 5s...	102	101	102	+1
Cal. Pet. 5s.....	97¼	97¼	97¼	0
Cal. Pet. 5½s.....	100⅞	100¼	100⅜	+ ⅛
General Pet. 5s.....	102¾	101¼	102	— ½
Humble Oil & Refg. 5s..	101⅜	101¾	101¾	0
Humble Oil & Refg. 5½s	102¾	102¼	102½	+ ¼
Pan Amer. P & T 6s....	102½	102⅜	102½	0
Pan Amer. P & T 6s....	80	80	80	—12
Phillips Pet. 5¼s.....	93	92¼	92¾	— ¼
Pure Oil 5½s.....	97½	96¼	96¼	—1¾
Pure Oil 5½s.....	96	95	95	— ¾
Richfield Oil of Calif. 6s.	79	75⅛	78½	+3
Shell Union Oil 5s.....	89½	88¾	89⅛	+ ⅛
Shell Union Oil with war.	91½	90	90	—1½
Sinclair Con. Oil 7s.....	102¾	102¼	102½	0
Sinclair Con. Oil 6½s....	101¾	101⅜	101⅜	— ⅛
Sinclair Con. Crude 5½s	101¾	101½	101⅝	— ⅛
Sinclair Pipeline.....	100	99¾	100	0
Skelly Oil 5½s.....	91⅜	90	90⅝	—1
S. O. N. J. 5s.....	101¼	103⅝	103¾	— ⅛
S. O. N. Y. 4½s.....	100	99¾	100	+ ¼
Transcontinental Oil 6½s	109⅞	109⅞	109⅞	0
Union Oil of Calif. 6s A..	106¼	106	106	—3
Union Oil of Calif. 5s C..	100⅜	100⅜	100⅜	0
Union Oil of Calif. 5s war.	97⅞	96½	97	— ¼
Warner-Quinlan 6s.....	55	52	53	—5
White Eagle Oil 5½s war.	102¾	102½	102½	— ½

New York Curb Bonds

Week Ending Nov. 7

	High	Low	Last	Change
Beacon Oil 6s '36.....	98	97½	98	+ ⅜
Cities Serv. 5s '66.....	82¼	80¾	80¾	—1
Cities Serv. 5s '50.....	91¼	77¾	78⅛	—12⅞
Cities Serv. G. 5½s '42..	90¾	88¼	88¼	—2¼
Cities Serv. G. P. 6s '43..	93	92½	92½	— ½
Cont. Oil 5½s '37.....	97⅝	96½	96½	—1¼
Empire O & R 5½s '42..	88⅞	85	85	—4
Gulf Oil 5s '37.....	102½	101⅜	101½	+ ⅜
Gulf Oil 5s '47.....	102	101½	101½	0
Indep. Oil 6s '39.....	101	101	101	0
Sun Oil 5½s '39.....	102⅜	101½	101½	0
Valvoline Oil 7s '37.....	101	99½	100	—2⅛

Oil Dividends

Amount	Payable	Stock of Record
Cumberland Pipe Line q.	$1	Dec. 15	Nov. 29
General Asphalt q.....	75c	Dec. 15	Dec. 1
Imperial Oil q.....	12½c	Dec. 1	Nov. 15
do special.....	50c	Dec. 1	Nov. 15
Ohio Oil q.....	50c	Dec. 15	Nov. 18
do pfd q.....	$1.50	Dec. 15	Nov. 15
S. O. California q.....	62½c	Dec. 15	Nov. 15
do stock.....	2%	Dec. 15	Nov. 15
S. O. Indiana q.....	62½c	Dec. 15	Nov. 15
S. O. Nebraska q.....	62½c	Dec. 20	Nov. 29
S. O. New Jersey q.....	25c	Dec. 15	Nov. 15
do extra.....	25c	Dec. 15	Nov. 15
S. O. New York q.....	40c	Dec. 15	Nov. 21
Swan-Finch pfd. q.....	43¾c	Dec. 1	Nov. 18
Union Tank Car q.....	40c	Dec. 1	Nov. 15
Vacuum Oil q.....	$1	Dec. 20	Nov. 29
do extra.....	25c	Dec. 20	Nov. 29